The Electrical Industry's Weekly Magazine

June 17, 1957

Electrical World

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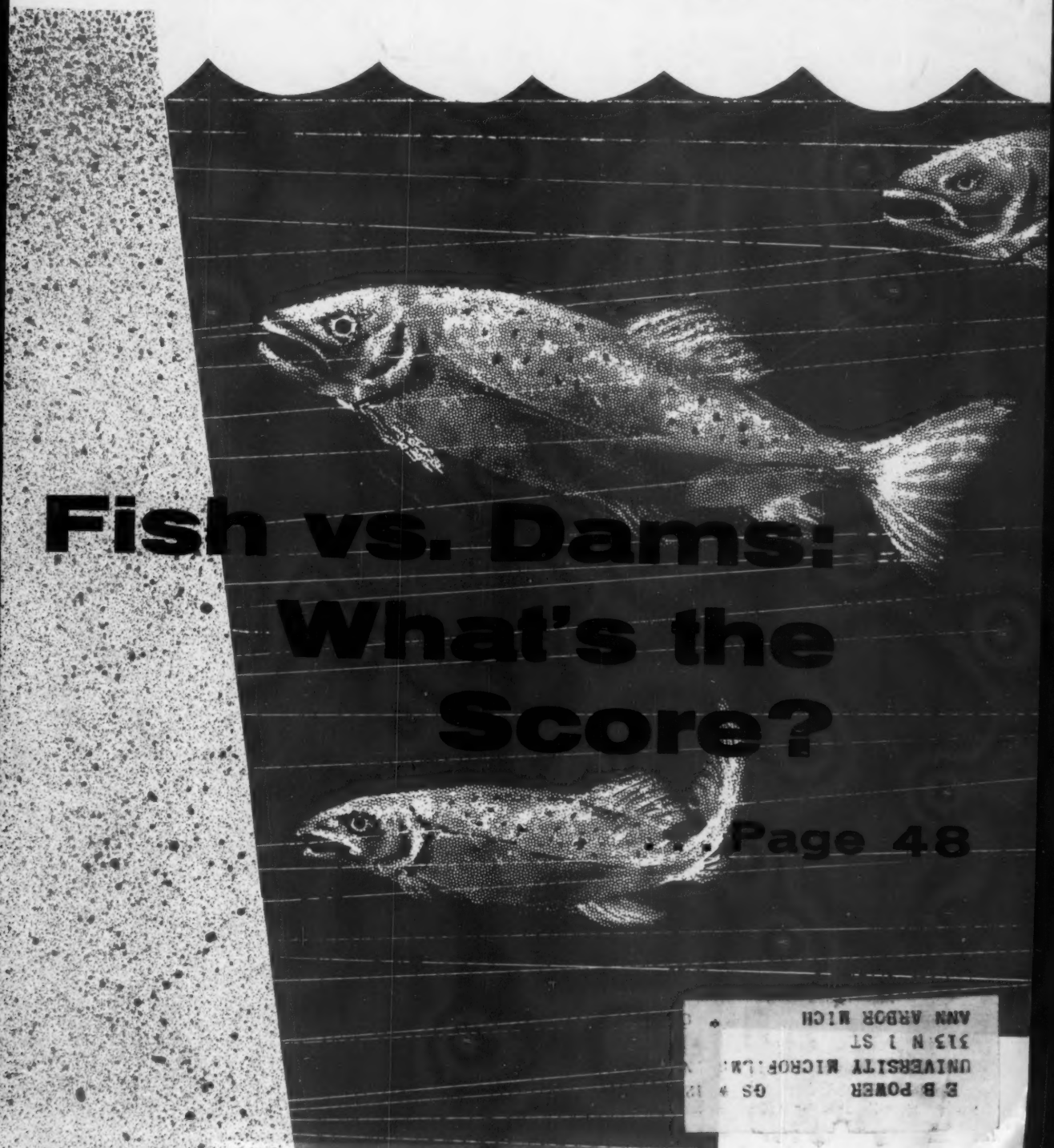

Fish vs. Dams: What's the Score?

. . . Page 48

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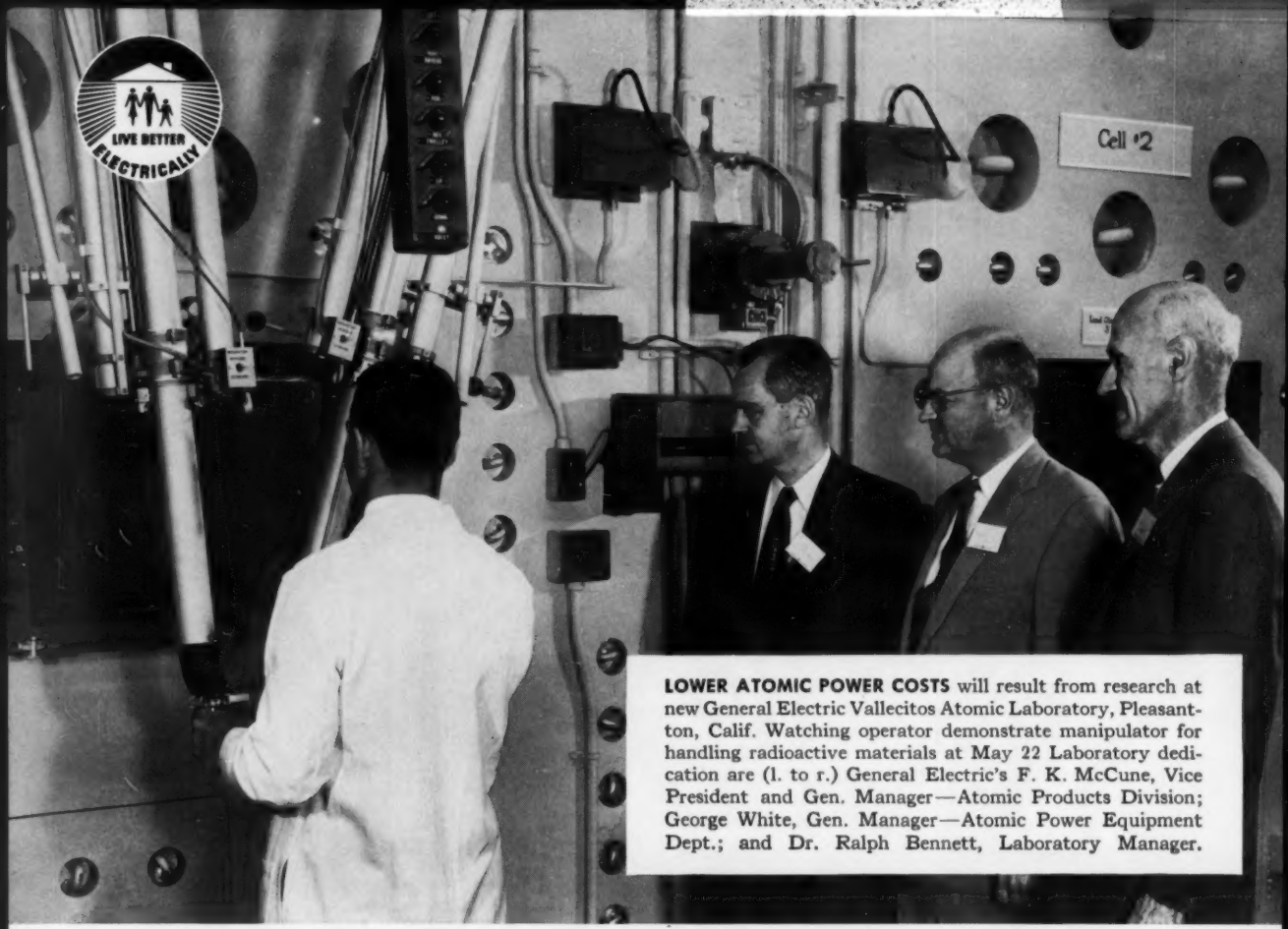

LOWER ATOMIC POWER COSTS will result from research at new General Electric Vallecitos Atomic Laboratory, Pleasanton, Calif. Watching operator demonstrate manipulator for handling radioactive materials at May 22 Laboratory dedication are (l. to r.) General Electric's F. K. McCune, Vice President and Gen. Manager—Atomic Products Division; George White, Gen. Manager—Atomic Power Equipment Dept.; and Dr. Ralph Bennett, Laboratory Manager.

New research heralds lower atomic power costs

General Electric Vallecitos Atomic Laboratory will help electric utilities meet growing power demands

As the nation anticipates an annual power demand rising to more than one million kilowatt-hours within the next decade, the electric utility industry is focussing its attention on the role atomic energy will inevitably play in meeting this vigorous growth. A glance at the nation's energy reserves helps place A-Power in its proper perspective. It is estimated that nuclear resources constitute approximately 95% of our total energy reserves.

QUESTION OF COST

A prime concern of electric utilities is the present cost of atomic power. Increasingly efficient steam plants make a constantly moving economic target for atomic industry specialists. General Electric's new Vallecitos Atomic Laboratory, dedicated last month, is an important step in the direction of low-cost atomic power. The developmental Boiling Water Reactor, one of three initial facilities at Vallecitos, will furnish vitally needed operational data on BWR plants—including the dual cycle BWR for the 180,000-kw Dresden Nuclear Power Station which General Electric will build for Commonwealth Edison Co. and the Nuclear Power Group, Inc.

ANSWERS FROM NEW LAB

A general-purpose research and development program at the Vallecitos Laboratory is expected to show progress in the design of reactors which reduce the use of non-standard materials, and which require less precision work in their manufacture. Objectives in the area of nuclear fuel will be longer burnup, reduced reprocessing costs, and reduction in the complexity of fuel cladding or its elimination entirely.

The vital experience gained by operating the Vallecitos reactor, plus the research and development done in the Laboratory will stride in the direction of lowering atomic costs. For information on General Electric's progress in atomic developments, contact your local Apparatus Sales Office. General Electric Company, Section 301-341, Schenectady 5, New York.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 24 JUNE 17, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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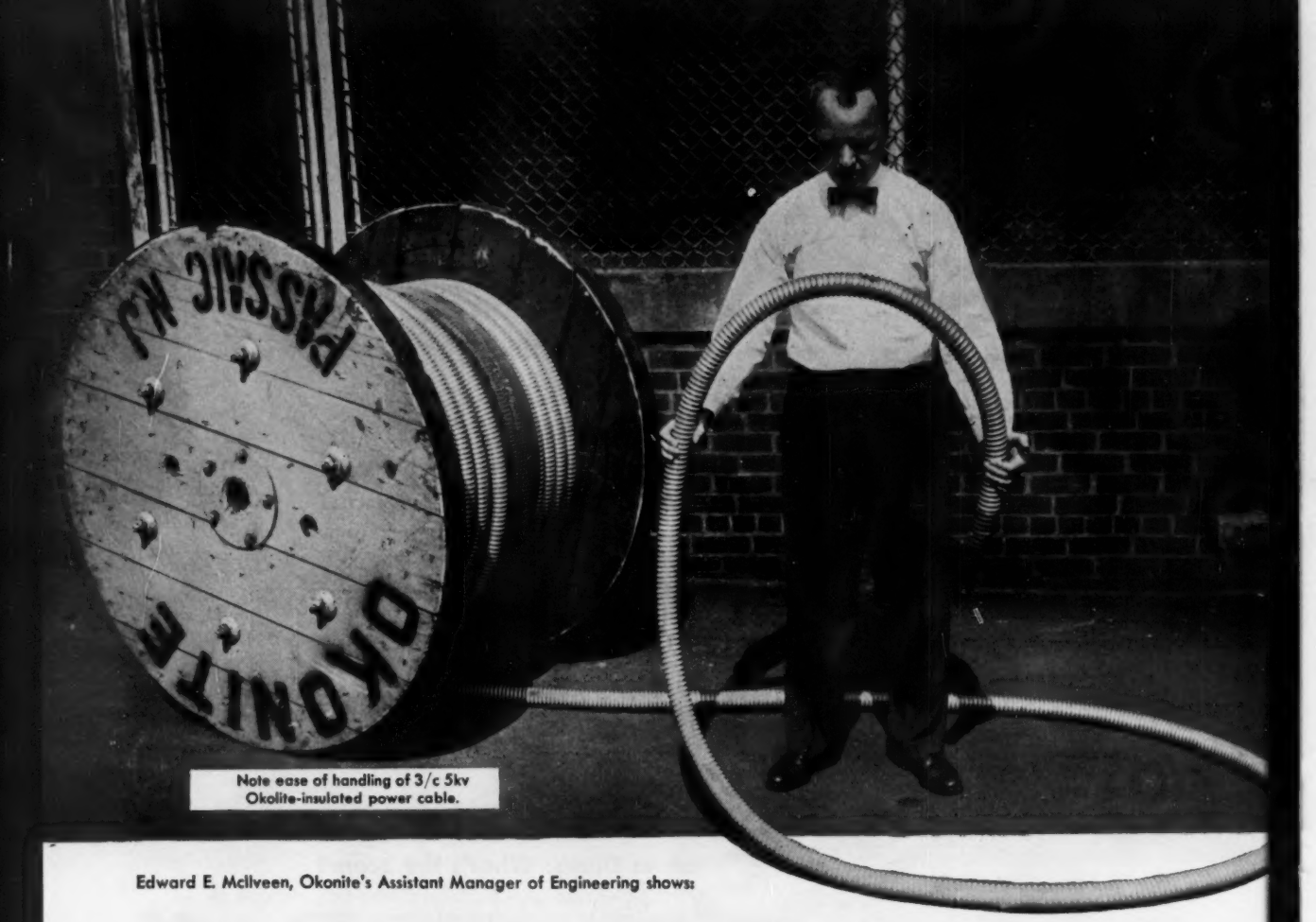

Note ease of handling of 3/c 5kv Okolite-insulated power cable.

Edward E. McIlveen, Okonite's Assistant Manager of Engineering shows:

Why Loxarmor is the low cost alternative to conduit

Rubber-insulated Loxarmor Interlocking S-shaped armor cables provide an ideal combination of flexibility, light weight and mechanical strength. Where rigid conduit is not desired, Loxarmor is the No. 1 alternative for either power or control circuits. Here's why:

Material and installation costs are lower. Eliminates conduit and related installation procedures such as making bends and using pull boxes. It is especially useful in cramped quarters.

Circuits are easily added or re-routed—usually trained in trays or racks, Loxarmor cables can be easily moved.

Easy accessibility reduces down-time—permits quick inspection. Can be installed indoors and outdoors.

Loxarmor occupies less space—not much more than half the space is required for multiple Loxarmor circuits vs. circuits in conduit.

Loxarmor can be supplied with the strip-insulated insulations Okolite oil-base or Okonex butyl-base; with extruded Keystone or Watertite insulations; or with varnished cambric—all depending upon your installation conditions and voltage requirements.

Loxarmor is available in galvanized or stainless steel, aluminum, bronze or copper armor. May be obtained with either copper or aluminum conductors. For further information write for Bulletin EW-1090. The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

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. . . *from the publisher*

What will heat storms do to you this year? Are money rates going down? How much will you pay for fuel in the months ahead?

These are questions for which every utility man wanted answers. And Electrical World editors provided them—at least the best ones available—in a series of recent special news features.

The editors refer to these pieces as "enterprise" articles. They're apparently well named. A recent two-page story on utility credit practices (EW, May 13, p 76) required the combined efforts of 10 correspondents and four EW field editors. It took some 90 individual calls and more than six weeks time from conception to printed page.

More answers to utility management problems are in the mill. Among them: A new region-by-region look at air conditioning and what it's doing to utilities; the impact of the national highway program; what's ahead for fuel re-processing, and the management reorganization problems that face more and more utilities.

Latest "enterprise" story deals with the ever present fish vs dam problem in hydro developments. "In this story," says one editor, "we have viewpoints from everyone but the fish." You'll find it on page 48.

Fischer Black

ELECTRICAL WORLD

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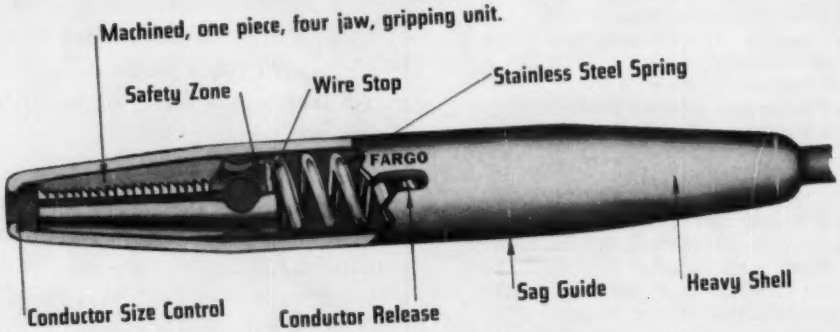
The inside story...

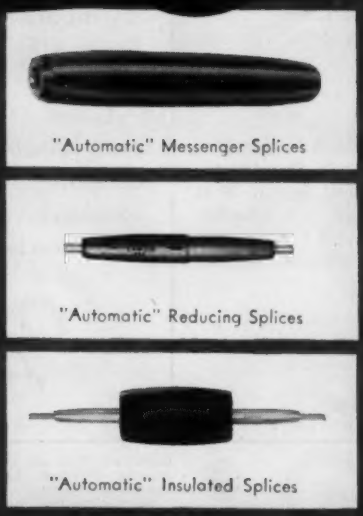


ALUMINUM OR COPPER

Fargo Line Splices

Quick as a wink you've automatically . . . without tools . . . made a permanent connection with a Fargo Line Splice and saved time and money in the bargain. Inside the tough copper (or aluminum) shell is a fool-proof, precision engineered, gripping jaw that works right every time. It's the inside story that counts . . .

The famous Fargo one-piece jaw with four segments assures perfect alignment for a sure grip on the conductor. Mechanically, it can't be beat, and electrically, the splice including contact resistance, has greater conductivity than an equal length of conductor.



Fargo "Automatic" Line Splices are available in a wide choice of types and materials. There are types available for aluminum or copper conductors, reducing splices, insulated splices, messenger splices . . . dead ends, too.

You'll save time, money and headaches on new construction, and emergencies, with Fargo Automatic Line Splices.

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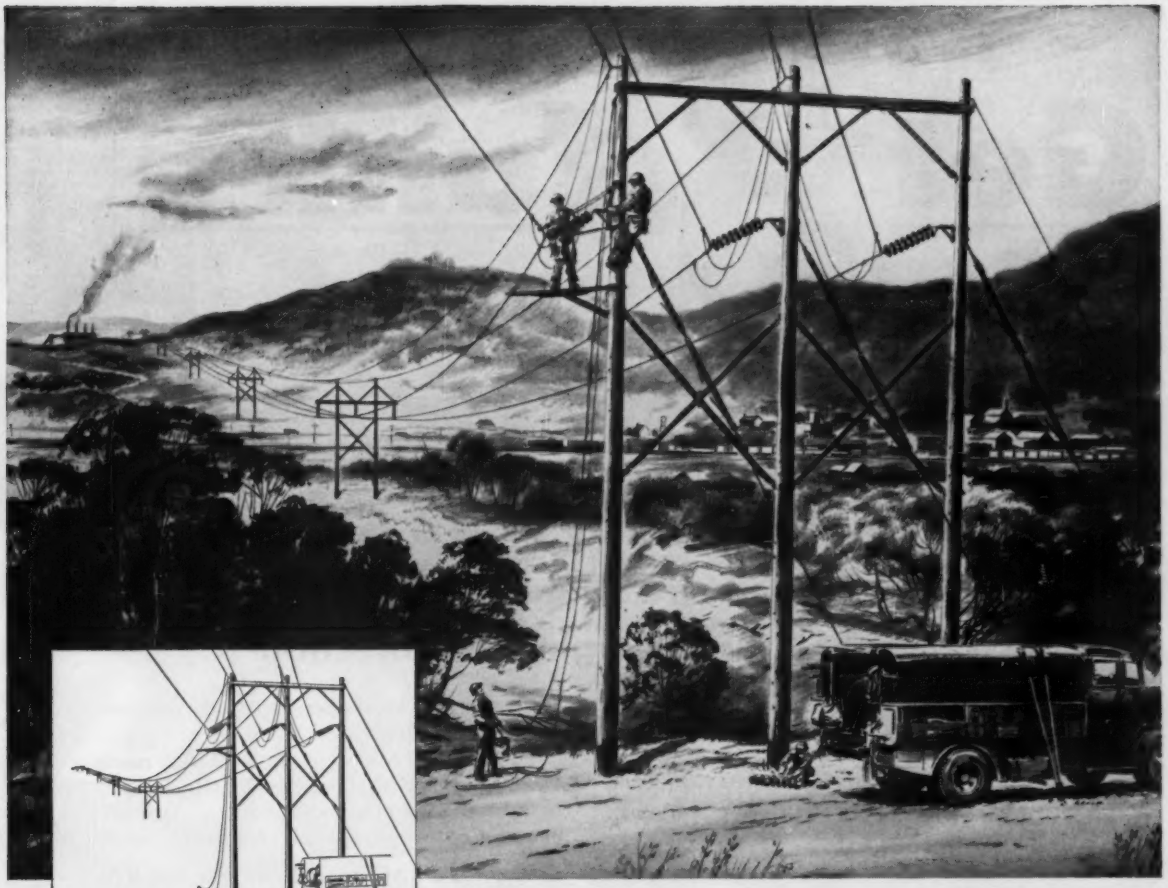

You can get prompt help with any outside construction problem through your Graybar office. In over 130 cities there are Graybar offices and warehouses ready to fill your every need for line materials, hardware and tools. And through any of these offices you can get the help of Graybar Outside Construction Specialists, strategically located in 19 principal cities, equipped by training and experience to give you prompt, dependable help.

Rough terrain—exacting specifications?

Call on Graybar for everything you need

Line building can challenge the skill and ingenuity of the best transmission engineers. When the line runs through rugged country, when the specifications are precise, take full advantage of the broad facilities and specialized experience of Graybar. No matter where your job site may be located, no matter what new requirements may be presented in tensions, insulation and erection, call on Graybar for engineering assistance as well as all your transmission line materials and supplies. If you would like to see our bulletin on High Voltage Transmission Line Materials, and you are located in the U. S. or its possessions, write us for your copy. It's complete with illustrations, applications and specifications. It is free, of course. 710-96

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Get 3 Tanks for best protection

1

It Takes More Than One Tank for That Extra Margin of Protection

Here's big breaker construction in a small outdoor distribution breaker! It costs you no more, so why take less?

Compare this breaker with others of the same rating and see the difference. Allis-Chalmers breakers offer:

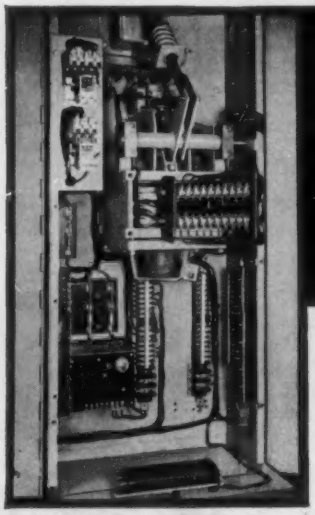
Tank-per-phase construction — Phases are completely isolated to eliminate internal phase-to-phase flashover and provide maximum protection on today's low reactance systems with their corresponding high fault currents.

Two vertical breaks per phase — Using time-tested *Ruptor* devices.

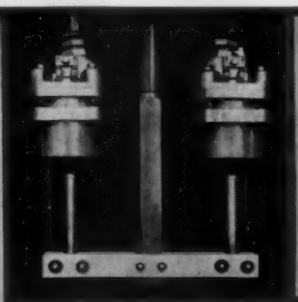
Standardized control wiring — Wiring meets NEMA and AEIC standards. Permits breaker to be moved from one location to another without the need for complete rewiring, as in the past.

Get More Information! For the complete story call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

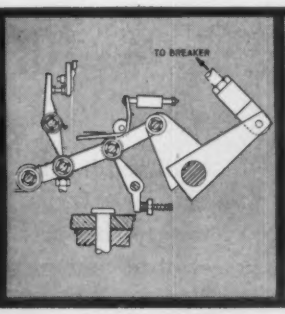
Ruptor is an Allis-Chalmers trademark.



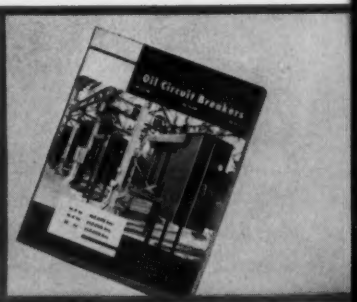
AEIC-NEMA standardized control wiring facilitates changing external control scheme to meet individual requirements without changing basic internal wiring scheme.



Two vertical internal breaks per phase... features time-proved, fully tested *Ruptor* interrupting devices with self-wiping, self-aligning tulip and bayonet contacts.

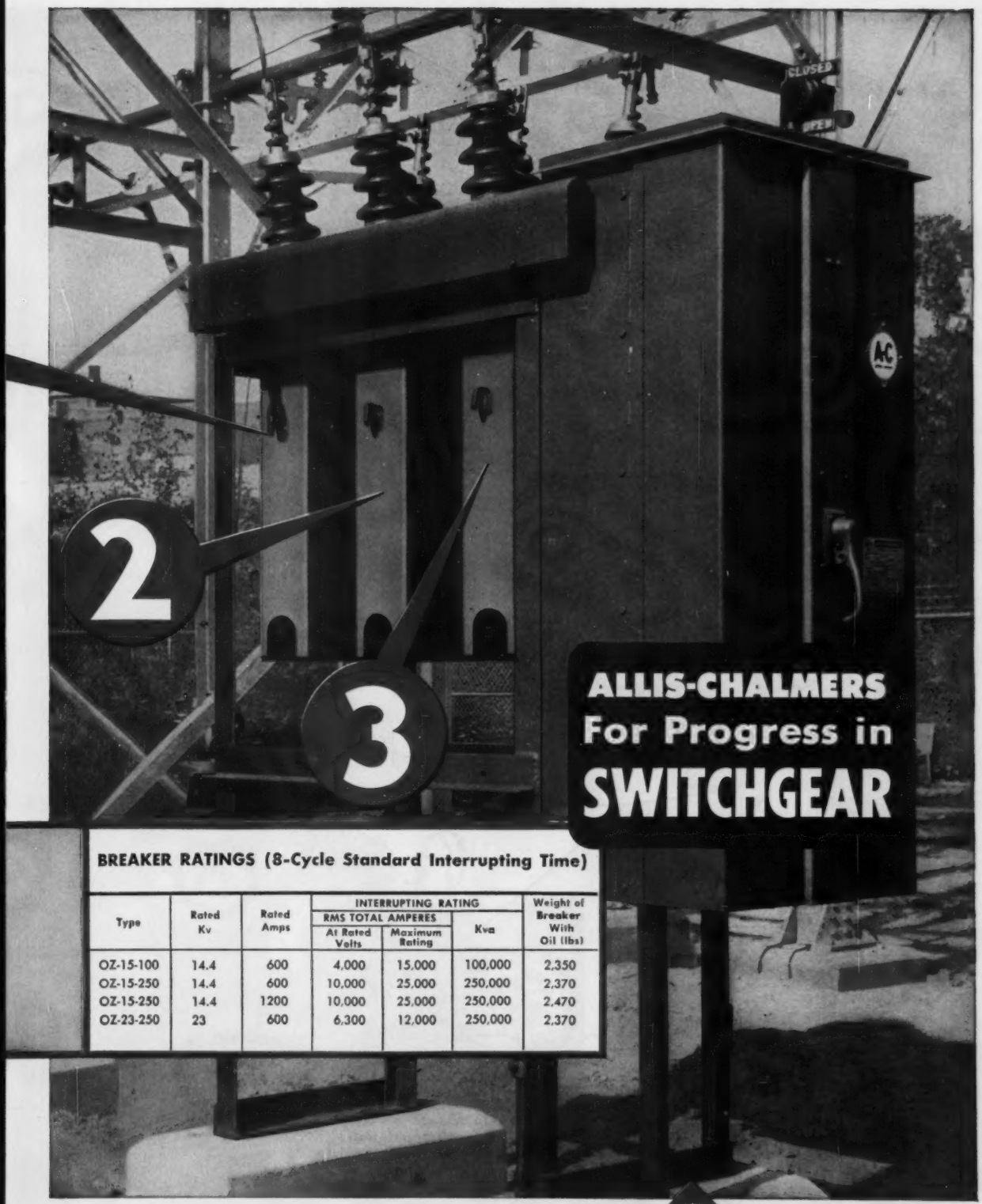


Four-bar linkage like ones on large A-C breakers provides mechanically trip-free operation. Simple solenoid operator—factory-set shim adjustments cut maintenance.



Eight-page bulletin 71B7946 tells the complete story. It shows the many quality features ordinarily found only in the larger breakers built into these units.

ALLIS-



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For Progress in
SWITCHGEAR

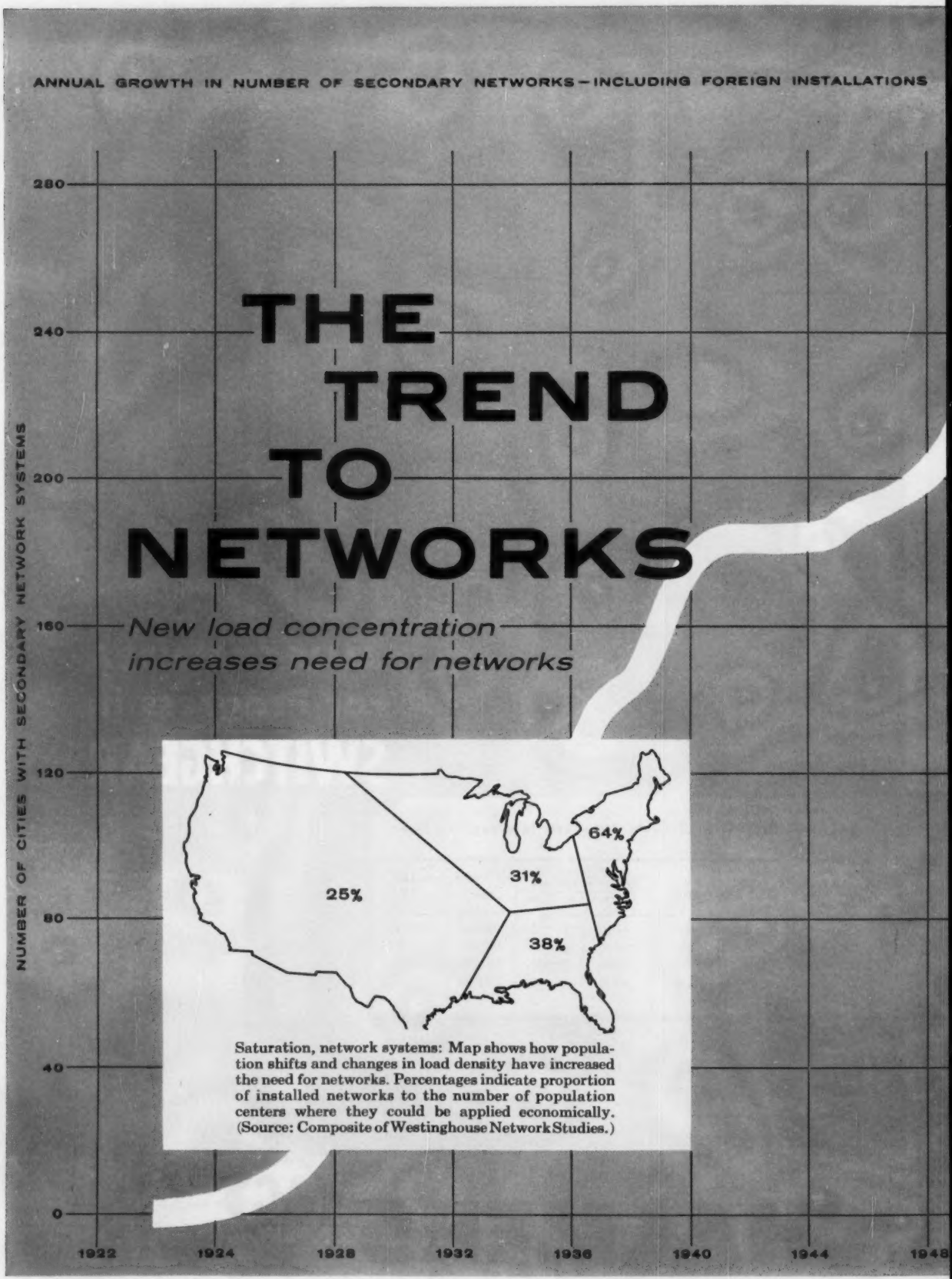
BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Kv	Rated Amps	INTERRUPTING RATING			Weight of Breaker With Oil (lbs)
			RMS TOTAL AMPERES		Kva	
			At Rated Volts	Maximum Rating		
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

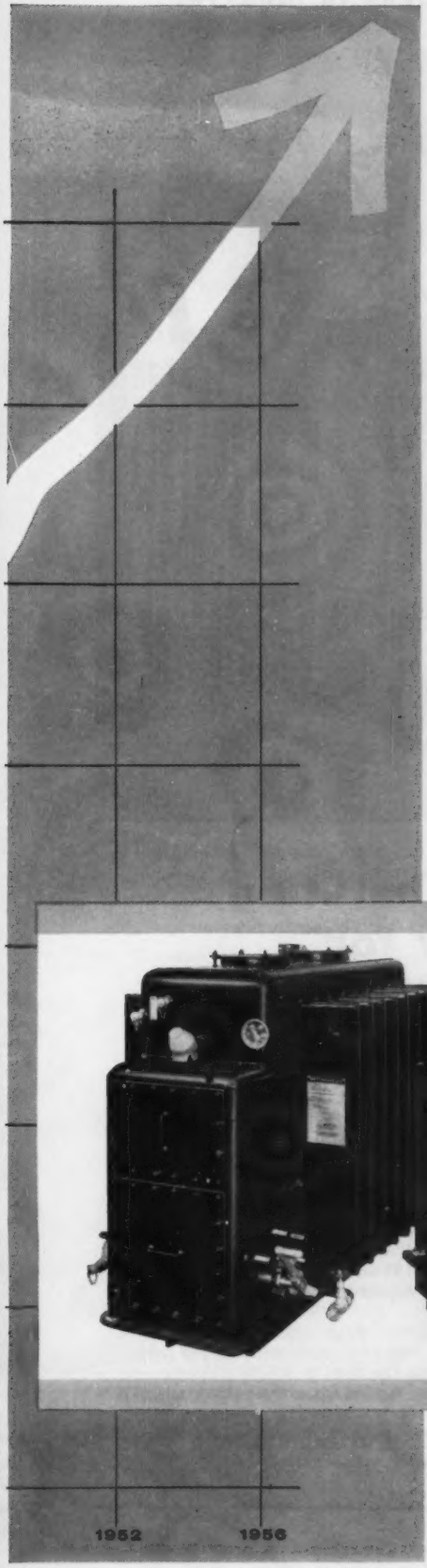
CHALMERS

A-C ALLIS-CHALMERS

A-5144



Saturation, network systems: Map shows how population shifts and changes in load density have increased the need for networks. Percentages indicate proportion of installed networks to the number of population centers where they could be applied economically. (Source: Composite of Westinghouse Network Studies.)



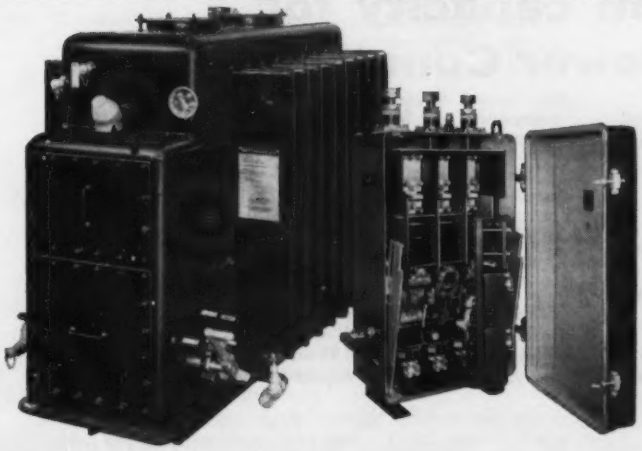
TWO FACTS STAND OUT:

1. Over 280 automatic a-c network systems have been put into operation since the first installation in 1922.
2. Westinghouse systems experts estimate that 58.1% of U. S. cities that could use networks economically do not have them.

Fact one, particularly in the trend of the postwar years, indicates that network systems are achieving increasingly rapid acceptance . . . thirty-four years of unchallenged superiority when accommodation for load growth, flexibility, and dependability are of paramount importance.

Fact two might indicate that many more cities should have networks under serious consideration right now. Do you have an area you serve where the a-c secondary network could be the answer to your projected distribution problems?

Westinghouse engineers will be glad to cooperate with you and your consultants in network studies. Westinghouse equipment can simplify your conversion and expansion problems. J-97201



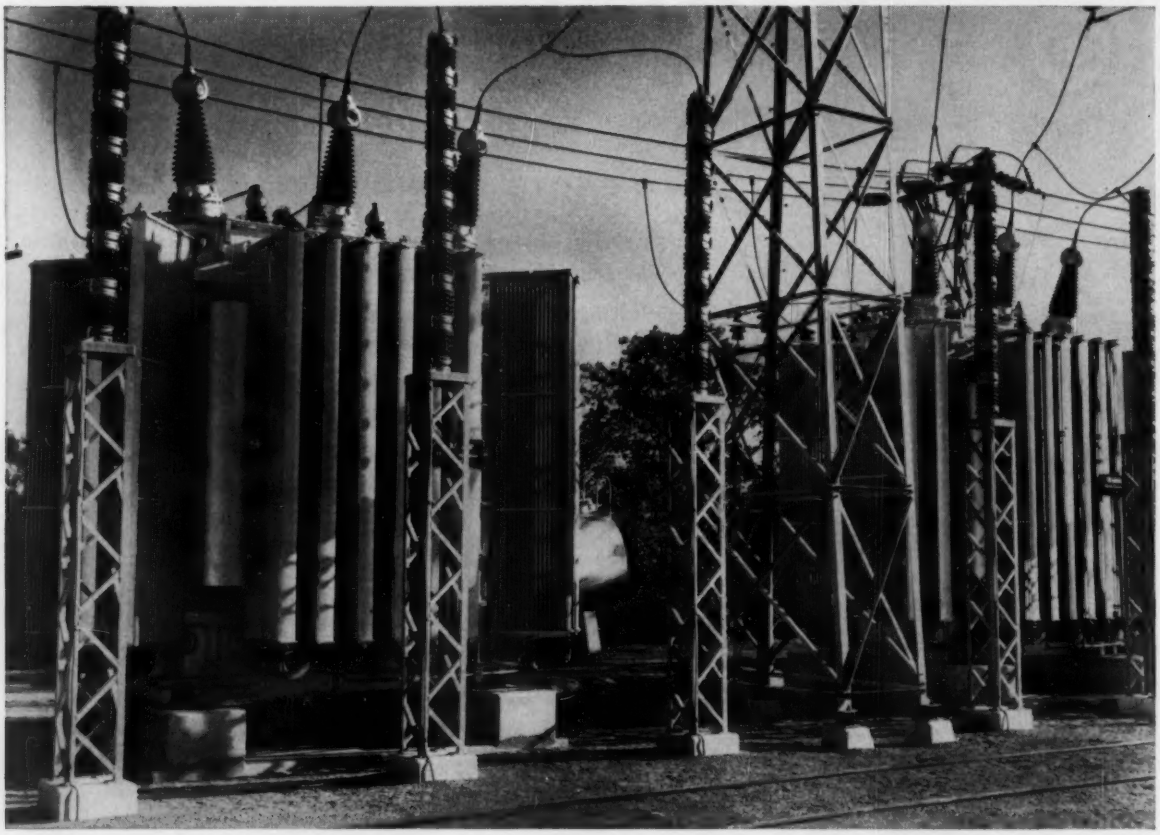
Westinghouse network transformer, liquid immersed, for vault installation below street or sidewalk level. Unit shown is Space-Miser design with new Yukon Coolers.

Standard Westinghouse network protector is shown, right. In addition to standard ratings, all classes, Westinghouse has developed units for heavy, medium and light load density in 120/208-volt and 265/460-volt service.

YOU CAN BE SURE...IF IT'S

Westinghouse

WAGNER TRANSFORMERS . . . THE CHOICE OF LEADERS IN INDUSTRY



New Wagner-equipped substation adds system capacity for Alabama Power Company

Utility company planning to meet increasing residential loads calls for ever-increasing capacity and more and more transmission and distribution substations.

Alabama Power Company has recently completed the installation of two new Wagner power transformers at its North Auburn Substation. These transformers are rated 22,500 kva, 110,000 to 69,000 volts, 3 phase, 60 cycle.

The choice of Wagner Transformers for this installation points up the fact that more and more power companies are looking to Wagner for their transformer needs.

Wagner builds standard and special power transformers to meet practically all kva and voltage requirements. You might consider taking advantage of the savings in time and dollars by specifying Wagner standardized units for medium sized transformers. Check ASA Standards C57.12.

Consult Wagner about your next power transformer installation. 32 branch offices are at your service. Wagner Bulletins TU-181 and TU-16D tell the whole story. Write for your copies today.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

T57-9

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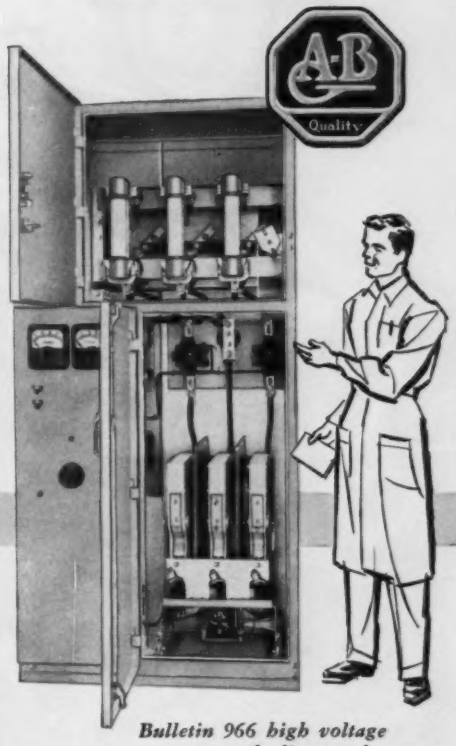
AIR BREAK

MOTOR STARTERS

(Max 5000 volts)



Bulletin 966 high voltage across-the-line synchronous starter with new, long life, air break contactor.

Allen-Bradley has developed a new high voltage contactor—incorporating the same design features which have made the corresponding low voltage control so universally popular. The features listed below are your assurance of completely satisfactory starter operation—no matter what the service may be!

1—Only one moving part. Simple solenoid design eliminates all pins, pivots, and "flexible" jumpers.

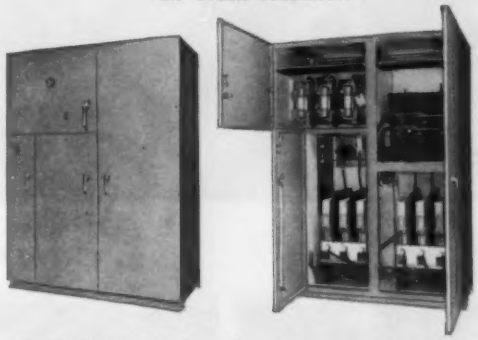
2—Double break, silver alloy contacts. Always in perfect operating condition.

3—Straight up and down solenoid motion assures good uniform contact pressures.

4—Compact. Unique design and development of new materials made possible a switch of unusually small size.

5—Easy access from the front. Easy to inspect and maintain.

6—Faster arc suppression. Double break contacts, plus new blowout design, plus novel arc chutes assure rapid arc extinction.



Bulletin 1172 high voltage, reactor type starters for squirrel cage motors, with the new air break contactor for heavy industrial service.

Using this new contactor as a base, Allen-Bradley has available a complete line of starters for all types of high voltage motors. For standard squirrel cage and synchronous motors, full voltage and reduced voltage, either nonreversing or reversing starters are listed. These high voltage starters can also be furnished for use with part winding or slip ring motors.

All Allen-Bradley high voltage starters are equipped with current limiting fuses and a front operated disconnect switch which is interlocked with not only the doors of the enclosure but also the high voltage contactor. Overload relays with current transformers provide continuously reliable motor overload protection.

For complete information about this new line of Allen-Bradley high tension starters, write for new engineering pamphlet.

ALLEN-BRADLEY

MOTOR CONTROL

QUALITY

Allen-Bradley Co.
1327 S. First St., Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd., Galt, Ontario

ACSR **that can meet or exceed your toughest requirements. Put Kaiser Aluminum's growing leadership in extra high-voltage research to work for you today!**

Triplex—combining three wires in one compact assembly—makes possible neater services, fewer attachments, easier installations—for big savings.

Power Cable that eliminated 26 competitive cables in time periods of from zero to 2,509 hours of a High Ozone Attack test—then went on to 6,000 hours.

Weatherproof—One of the nation's leaders in covered conductor, Kaiser Aluminum supplies the finest distribution, secondary and service cable in the field.

AAAC, developed and introduced by Kaiser Aluminum! Gives greater strength in high conductivities and is stronger than All Aluminum Conductor.

IF IT CARRIES CURRENT

KW CARRIES IT!

Now! Unsurpassed benefits for electric utilities due to Kaiser Aluminum's recent purchase of the Wire and Cable Division of U. S. Rubber, located at Bristol, Rhode Island!

Now from one source, you get all the established KW products plus all products of the new Bristol mill (formerly Wire and Cable Division of U.S. Rubber). For former U.S. Rubber products, the same quality insulations and product guarantee terms will be continued.

Now from one source, you get the most advanced technical assistance in the industry—the full cooperation of the research and development leaders of both aluminum and copper conductors.

Now from one source, better-than-ever service—from two plant locations (Newark, Ohio and Bristol, Rhode Island). This includes service from the production, engineering, sales and distributor organizations of both Kaiser Wire and the former Wire and Cable Division of U.S. Rubber.

For immediate attention to any request for electrical conductor products, engineering and research service, or further information, contact your nearest Kaiser Aluminum sales office or the KW distributor listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Building, Oakland 12, California; *General Sales Office,* Palmolive Building, Chicago 11, Illinois.

Kaiser Aluminum

the bright star of metals

Portable Cord that gives you three times longer life than the average of molded cords of other makes. It's *proved* by 12,000 tests over a 3-year period.

Portable Cable: "It's the toughest, most flexible trailing cable we've ever used in our mines," says general superintendent of coal mining company.

Control Cable, backed by 67 years of experience in electrical wire and cable manufacturing. That means dependability—*proved security* for public safety!

Service Entrance Cable, now UL-approved for 75° wet applications! Improved design characteristics include pleasing appearance and ease of application.

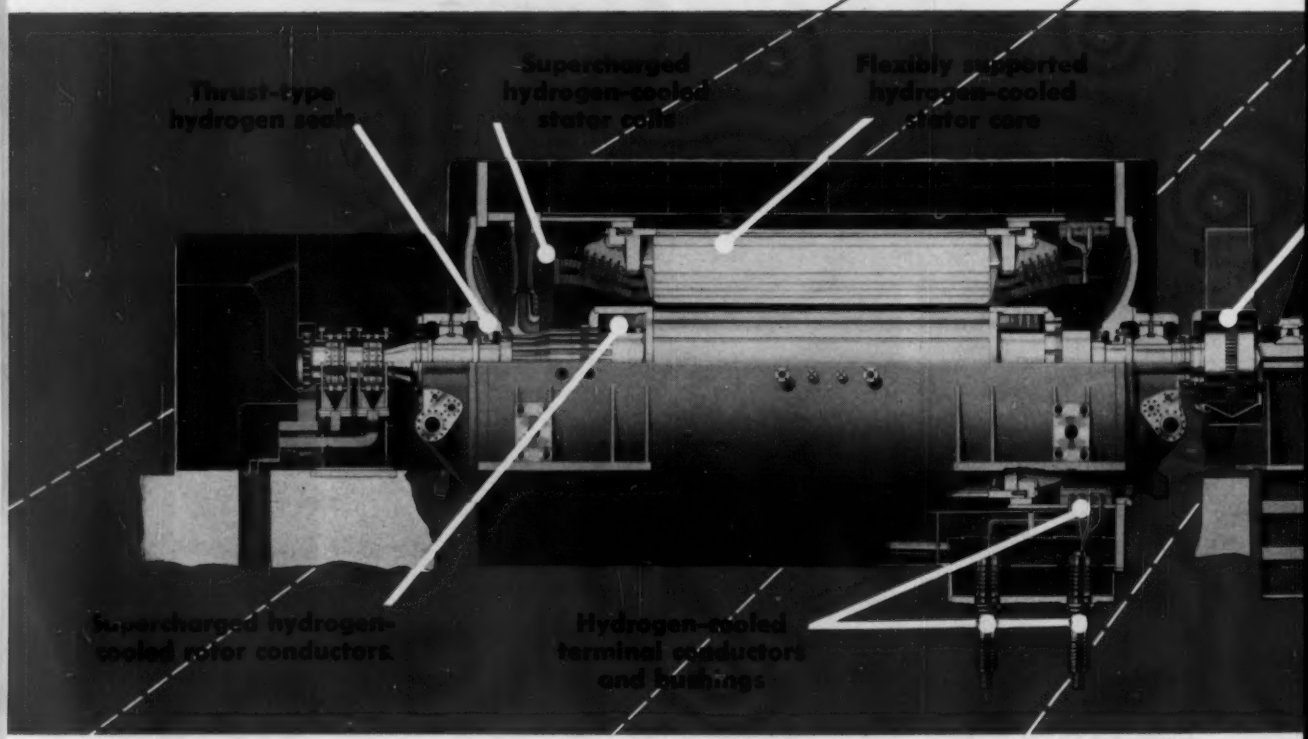
On the

. . . 150-mw double-flow reheat steam turbines with fully supercharged generators for Public Service Company of Indiana

THESE tandem-compound turbines with 26-inch exhaust blades embody such advanced design features as side crossunders that do not have to be removed during inspection; new underslung, side-mounted, two-speed turning gear; solidly bolted-down front control pedestal; and below-floor primary and reheat steam valves.

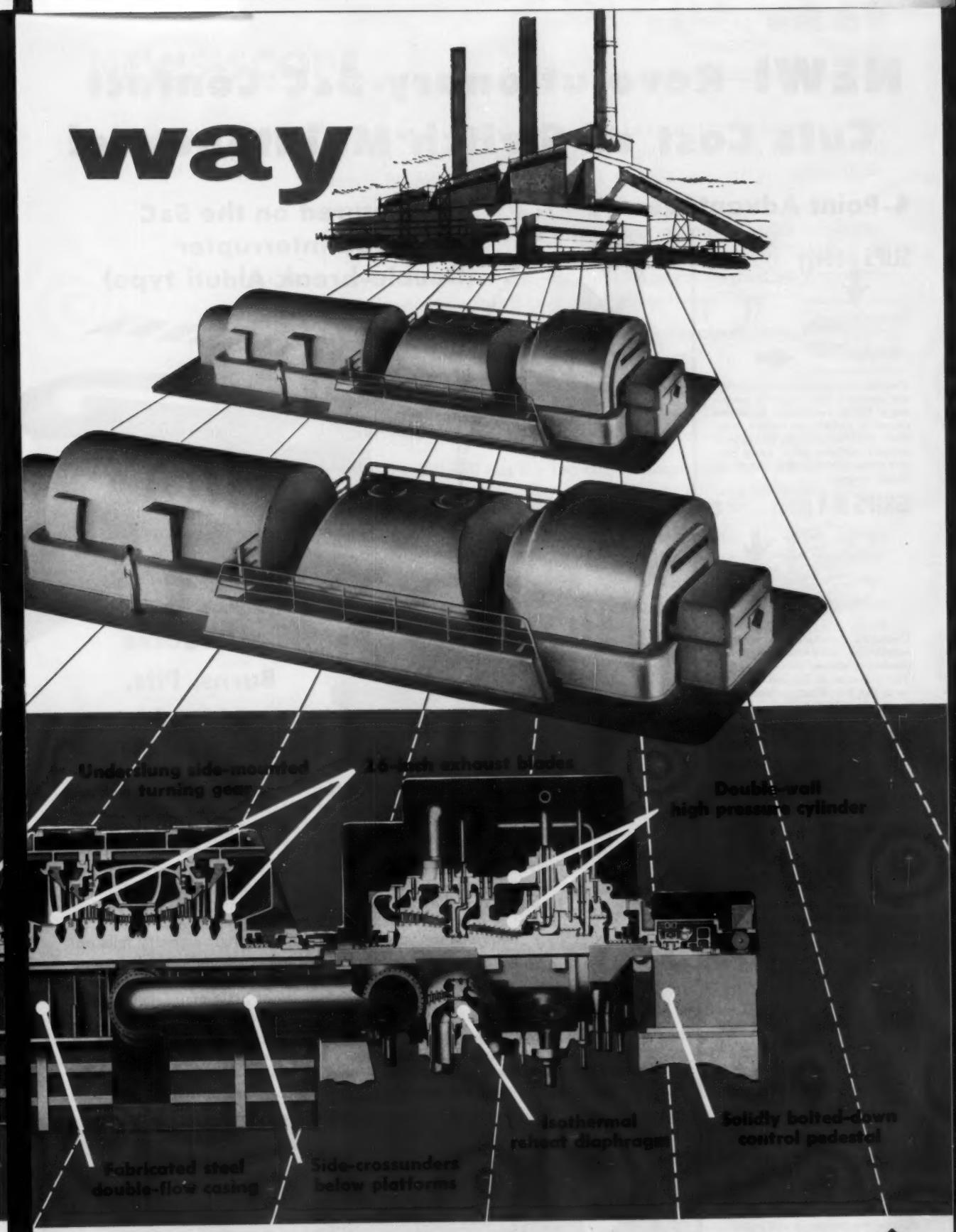
In the fully supercharged generators, high velocity hydrogen efficiently cools rotor copper, stator coils, core, terminal conductors, and bushings — applying fully the advantages of Allis-Chalmers pioneering in supercharged cooling.

Advances in design of double and triple-flow tandem ratings to 250 mw, and of 3600/3600 rpm and 3600/1800 rpm close-coupled cross-compound arrangements to 500 mw and larger, are discussed in publication 03R8620. Write your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.


Thrust-type hydrogen seals
Supercharged hydrogen-cooled stator coils
Flexibly supported hydrogen-cooled stator core
Supercharged hydrogen-cooled rotor conductors
Hydrogen-cooled terminal conductors and bushings

Units for New Albany Station of Public Service Company of Indiana. Turbine steam conditions: 1800 psig, 1000/1000 F, 1.5 in. Hg abs exhaust. Generators: 176,470 kva, 0.85 pf, 18,000 volts, 0.64 SCR at 45 psig hydrogen pressure. Consulting engineers: Sargent and Lundy.

way



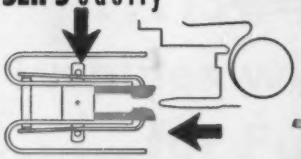
ALLIS-CHALMERS

A-5306

NEW! Revolutionary S&C Contact Cuts Cost of Switch Maintenance!

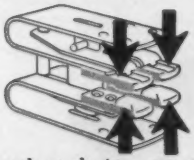
4-Point Advantage

SLIPS ~~easily~~



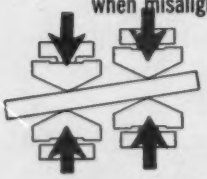
Tension bar and spacer prestresses contacts and reduces necessary force required to close contacts (effort at switch handle). Narrow convex silver-clad contact surfaces plow away any dirt from silver-nickel insert on blade tongue.

GRIPS at 4 points... not 2



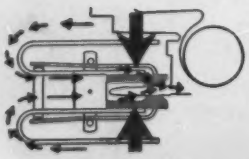
U-shaped conductors are split lengthwise to provide 4 independently sprung contact fingers. The pressure is applied to each by a flat beryllium copper loading spring.

GRIPS at 4 points... even when misaligned



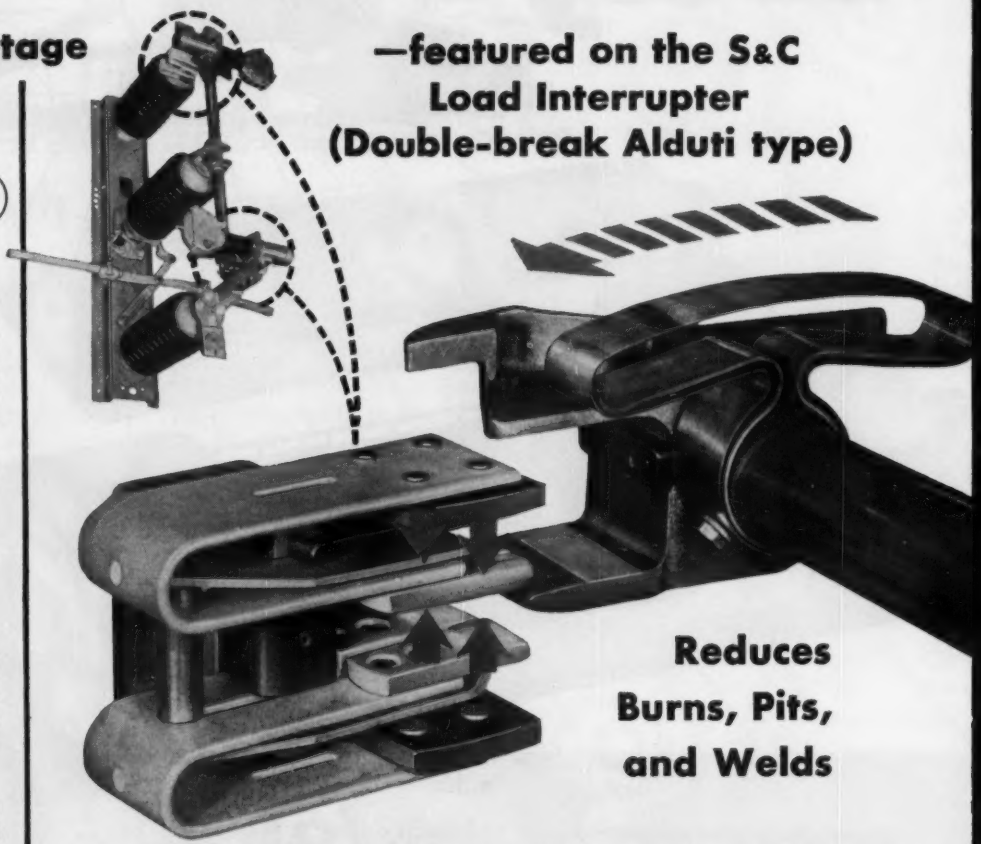
For 2 reasons: (1) Pressure is applied independently by springs in 3-point suspension which can rock and roll; and (2) pressure is applied equally on either side of blade by tension bar.

GRIPS harder... but only when needed



The reverse loop construction provides a magnetic field pattern during short-circuit current flow that causes repulsion and attraction forces to combine to produce heavier contact pressure when you need it.

—featured on the S&C Load Interrupter (Double-break Alduti type)



Reduces Burns, Pits, and Welds

NEMA standards specify the short-time current ratings for air switches and interrupter switches. And it is natural that equipment can be built to meet these requirements when new.

The big "if" is what happens in service.

You have found from experience that switches with conventional contacts must be carefully installed, and then continually maintained if they are to retain their original NEMA short-time ratings. As a practical matter such equipment generally gets little maintenance, and the short-time current capacity falls off.

You want a contact that meets NEMA standards after being in service, in spite of some misalignment in installation, and in spite of little maintenance. The Double-break Alduti has such a contact.

No more expensive contact maintenance work in the shop, dressing off burns and pits. No more worry about contacts welded shut after a momentary short-circuit loading. And the magneto-motive effect through the U-shaped contacts provides extra contact pressure when it is needed.

LIVE BETTER ELECTRICALLY

S&C

Specialists in High-Voltage Circuit Interruption Since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS • U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **EEI will open its storehouse of facts and statistics for broader public use.** Up to now its public reports and studies have been tailored mainly for industry people. With analysis and interpretation, these could be made of real interest to the layman.

Documentary TV series on engineering exploits is under consideration. It would be along the lines of the popular show, "Medic." A Hollywood producer will make pitch for cooperation of Engineers Joint Council at a July 2 executive committee meeting.

It's a good bet that Montana Power will announce increase in its common stock dividends this week.

Hot Congressional fight is expected over proposed new lobbying bill. Measure, sponsored by Sen John McClelland (D-Ark.) would tighten 1946 Act to cover advertising and indirect lobbying for first time.

Canadians will roll out the red rug of hospitality for AIEE Summer General Meeting. Reservations are already coming in at fast clip.

LATE NEWS ▶ **Idaho Power's scheduled completion date of Dec. 31, 1958,** for its Oxbow Dam had nothing to do with the issuance of a tax amortization certificate, Pres T. E. Roach tells Senate Anti-Monopoly subcommittee. Sen Estes Kefauver (D-Tenn.), attempting to prove Idaho Power is not entitled to the certificate, charged the completion date had been shortened to permit the company to obtain the ODM certificate.

Sen Harry F. Byrd (D-Va.), who plans to introduce a bill cancelling all tax amortization provisions, thinks efforts may be made to amend his bill revoking some existing certificates.

Columbus, Ohio, seeks lower rates for residential and small commercial users from Columbus & Southern Ohio. Announcement followed on heels of FPC report that Columbus residents pay higher bills ($7.50 per month average) than any big Ohio city ($7 average).

Kentucky Utilities asks PSC to okay $2.5-million rate boost—its first proposed hike in 37 years—to restore rates to 1942 level.

Expansions . . . Cleveland Electric Illuminating celebrates construction start of the 240,000-kw, $37-million turbogenerator which will double the size of the four-generator Ashtabula plant . . . FPC gives go ahead to Garkane Power Assn, Inc, for $1.6-million hydro project on East and West Forks of Boulder Creek, Utah.

Congratulations . . . Charles E. Strickland is new vice president of Interstate Power Co and manager of its recently acquired Mason City area . . . Western Light & Telephone Co elevates H. V. Rathbun to manager of transmission and distribution . . . At Duquesne Light Co, Daniel E. Nesbit rises to general purchasing agent and A. C. Stanojev to mechanical engineer . . . New executive vice president and director of Anaconda Aluminum Co is Mord Lewis . . . Leonard Shelly advances to VP post at Federal Pacific Electric Co.

ELECTRICAL WEEK

A TWO-MINUTE

FISH VS DAMS ▶ **In the Pacific Northwest it's fish vs dams,** with no holds barred. It seems that a high hydroelectric dam interrupts the life and love cycle of the revered salmon. This, in turn, upsets the commercial fishing industry conservationists, sportsmen, and others. Problem is: Can fish and dams co-exist? Some progress is being made, but there's still a long way to go (p 48).

EVENTS ▶ **At EEI convention,** awards go to American Gas & Electric, four Utah Power & Light linemen, and to Northern States Power Co. Kennedy and McAfee are re-elected to top posts (p. 40).

WASHINGTON ▶ **Senate gets bill which would amend lobbying act** to require all organizations to report certain advertising expenditures made for the purpose of influencing legislation (p 42).

GENERATION ▶ **Concentration of power in boiler feed pumps for supercritical units** presents vexing problems for design engineers. Turbine-driven pumps offer attractive alternative to motor-driven ones from the standpoint of space, restart from complete shutdown, and elimination of voltage drops in auxiliary power system. This is thesis of two Westinghouse engineers who note in article that auxiliary power consumed by a unit with 2,400-psi runs about 6% of output, while at 5,000-psi the consumption rises to 8.5% (p 60).

DISTRIBUTION ▶ **Heat-pump water heaters may halve the energy requirements** of conventional water heaters, Kansas P&L concludes after an aggregate of 13 years experience with three types of heat pump heaters. Coefficients of performance for test models ranged from 1.38 to 1.98 and load factors ranged from an estimated 19.6 to 31.6% for five models of one type. And the prospect is good that further development of the models will bring still higher coefficients of performance (p 57).

Consumers Power Co is trying a new plastic, spacer-type 15-kv cable as a possible solution to its tree vs primary feeder problem. Early results are promising. Construction closely parallels open-wire crossarm design used on the system and most of the construction kinks have been worked out. Approximately 25,000 ft of the spacer type cable has been installed on the system (p 53).

Ready reference for selecting proper guying equipment is found in this week's Engineering Reference Sheet. Here's a real find for distribution engineers and field crews as well (p 70).

COMMUNICATION ▶ **Closed circuit television is substituting for telemetering** at Georgia Power's Boulevard substation. Tests indicate the TV circuit can be used for scanning nine meters at distances up to 30 miles (p 68).

METERING ▶ **Mathematical method of setting up meter routes,** combined with an exact sequence of reading meters, is cutting meter reading costs at

Mississippi P&L. Just as important, it has equalized work loads, improved employee relations, and reduced reading errors by as much as 80%. The mathematical planning is based on precise time factors for walking or riding between meters, reading and resetting different types of meters, and the various obstacles in a meter reader's path (p 56).

INDUSTRIAL ▶ **The 3-phase frequency converter welder looks like a real boon** to both users and electric utilities which must supply the power. For the user its inherently high power factor lowers the industrial plant demand and consequently the power costs. In turn, high power factor and low demand reduce the size of power supply needed. And for the utilities, this type of welder minimizes the disturbance that resistance welders inevitably produce on distribution systems (p 54).

SELLING ▶ **Adequate wiring, billed as higher "quality" of electric living,** is helping to sell homes in Borger, Texas . . . And in Iowa, the Iowa Electric L&P recently issued its 1,157th certificate of adequate wiring since the Iowa AW bureau was established in mid-1953 . . . Application of electric heating in a wire covering process has cut scrap losses, greatly aided temperature control at a Euclid, Ohio, wire mill (p 78).

HEATING & COOLING ▶ **Biggest air conditioning year is shaping up,** Hotpoint survey shows. Sales are already running 25.5% ahead of 1956 and industry seems on way to 2 million unit year . . . Detroit Edison sells electric heating to the architect and engineer first. See how (p 74).

PEOPLE ▶ **At Louisville G&E George R. Armstrong is new president.** New utility vice presidents include: Robert H. Engels at Northern States Power, Andrew J. Haswell at Oklahoma G&E, and C. R. Stockhus at Union Electric (p 106).

MANAGEMENT ▶ **Inflationary pressures will ease over the long run.** Rugged competition, more than ample additions to plant and equipment, and a steadying of employment point to this conclusion. Clinchers are probability of continued tight money and status quo on taxes. **See EBO (p 99).**

MANUFACTURERS ▶ **Cables having aluminum sheath extruded directly on the core** will be marketed shortly by General Cable. The sheathing operation is performed in a press said to be first of type in U. S. (p 92).

NEW EQUIPMENT ▶ **Up to 7-ft holes at angles to 90 degrees is the range claimed for a suspended hydraulic earth boring machine.** It can be mounted front or rear on line construction truck bodies with any hydraulic derrick . . . Little drilling and no gaining is needed for universal angle spar connectors for joining round members in wood pole structures at any angle up to 90 degrees (p 83).

ENGINEERING TRENDS

Advance warning of hurricanes now seems assured. With radar equipment capable of tracking them at distances close to 300 miles, and with aircraft exploring their centers, their arrival time can be set 6 to 8 hours in advance. These investigations also reveal that a hurricane can form only over water of 81F or higher in the presence of an easterly wave, a weak low-pressure system, or a trailing polar front in the tropics. Once formed, its path is influenced by winds at all levels to 60,000 ft.

Ten million billion watts of energy have been produced by Swedish scientists in their studies to harness hydrogen power for peaceful purposes. The energy was produced for about a microsecond.

Condenser air leakage has been detected with Freon and a halogen detector at New Orleans Public Service's A. B. Paterson station. Freon is sprayed around suspected source of leakage. If leak is present it is confirmed by a change in color of the flame detector set up at exit of the steam jet ejector.

Inherently safe nuclear reactors are a possibility with a new device called by its designers a "convergatron". Device is a neutron amplifier which would permit use of a subcritical mass of uranium fuel, thus making an unscheduled reactivity increase impossible.

High temperature properties of polythene are improved to a marked degree by exposure to radiation. The irradiated polythene is converted to an elastic rubber-like substance which retains its form and appreciable strength.

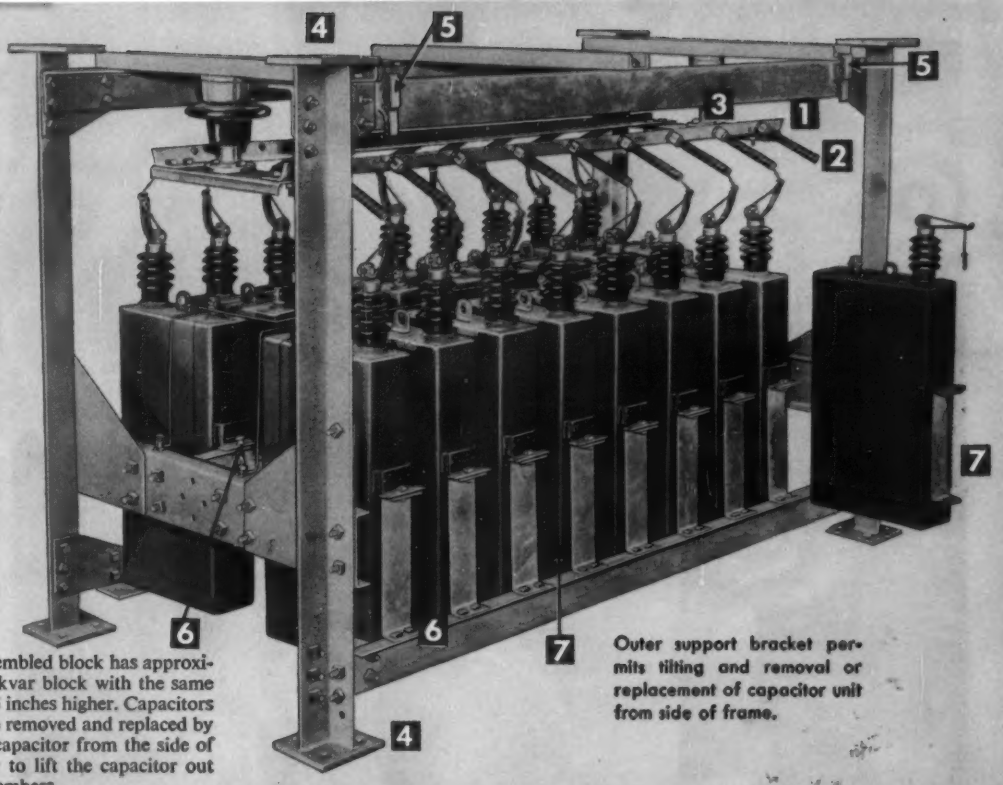
Geothermal steam will produce 69 Mw of electricity in New Zealand. Pipes will carry the steam 10,000 ft from the steam producing area to North Island, New Zealand.

Reducing the use of lightning arresters in multi-line substations calls for caution lest vital equipment be deprived of needed protection. There is always a possibility that circuit breakers, tripped by previous line flashovers or system disturbances, will be open at the time of a subsequent stroke which finds the station unprotected.

FROM EDITORS IN THE FIELD

Increased efficiency in equipment and personnel is realized by Duquesne Light after three months' operation in new system dispatch center. Better function grouping and operating atmosphere also give intangible benefits.

Individual ties of Nylon tape hold cable in triangular configuration in a new pipe-type cable installation. Ties are spaced about 15 ft.


1 Aluminum-alloy bus
2 Bus-mounted fuses
3 Bus connections wire brushed and treated with oxidation inhibitor.
4 Jig-assembled for perfect alignment of mounting pad bolt holes.
5 Lifting lugs.
6 Tapped holes in frame for capacitor mounting bolts. Nuts not needed.
7 Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

Another L-M First...

L-M's 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Industries

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA-standard 50 kvar capacitor equipments. Prompt delivery . . . on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Industries, Milwaukee 1, Wisconsin.

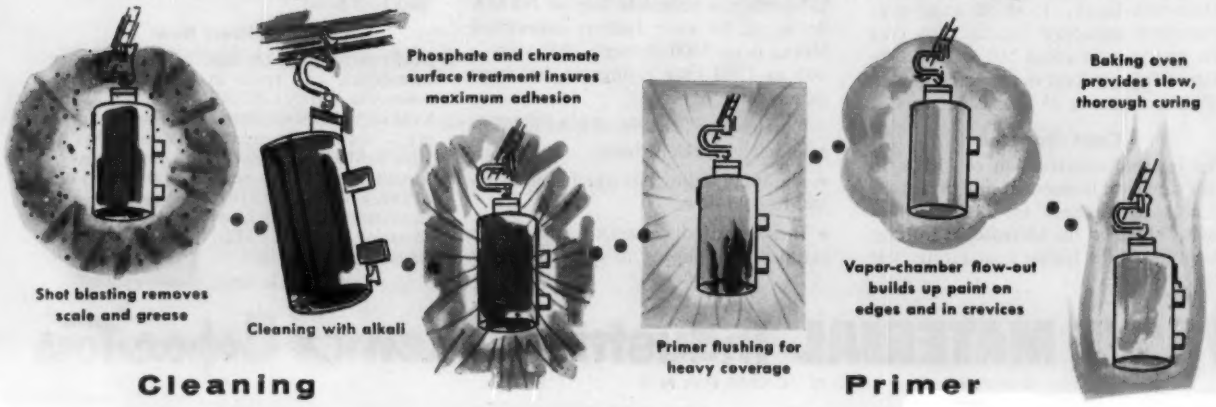
McGRAW EDISON

296-AR-2

LINE MATERIAL Industries *Elemex® Capacitors*
McGRAW-EDISON COMPANY

Tanks are on a continuous conveyor system. Photo shows heavy-viscosity primer as it is flushed on the transformer tank just prior to entering the vapor chamber.

Flow Diagram, Vapor-Chamber Flow Coating Process


Shot blasting removes scale and grease
Cleaning with alkali
Phosphate and chromate surface treatment insures maximum adhesion
Primer flushing for heavy coverage
Vapor-chamber flow-out builds up paint on edges and in crevices
Baking oven provides slow, thorough curing
Cleaning
Primer

Another L-M First...

New Vapor-Chamber Flow Coating Protects Tank Edges, Crevices

By **MARTIN L. ZWELLING**
Assistant Manager of
Engineering, Transformers
Line Material Industries

Line Material has adopted a revolutionary new vapor-chamber flow coating process that radically improves tank-corrosion protection on L-M Round-Wound® transformers. The outstanding feature is that the vapor-chamber treatment improves paint film thickness and uniformity on edges, in crevices, and over welds—spots that characteristically are the first to rust.

The process includes seven-stage surface cleaning and preparation; flow coating with heavy, viscous primer and finish paints, each coat passing through the unique new vapor-chamber treatment. The secret of the process is that the vapor in the chamber carries a high concentration of paint volatiles. These keep the paint fluid, and the paint actually flows toward and completely covers critical edges, sharp corners, welds, and crevices.

Automatically Controlled

The heavy paint film is maintained as the tank passes through the baking oven. Humidity and temperature in the oven are closely controlled for proper curing. The entire process is completely mechanized. Automatic controls insure uniform paint coverage.

L-M's newly developed vapor-chamber flow coating process gives better tank protection, partly because it does everything that every previous paint process has done—and does it better—and chiefly because it gives extra protection to areas that are always the first to rust. Here are the principal features:

1. Thorough seven-stage surface treatment —shot-blasting, alkali washing, phosphating and chromic acid passivation, with intermediate rinses followed by dry-off to insure maximum adhesion.

2. Even coverage with highest-grade primer and weather-resistant finish paints.

3. Heavy build-up on edges, sharp corners, welds, and in crevices, resulting from flow-out during the vapor-chamber stages.

4. No human element—entire process is completely mechanized and automatically controlled.

All-Weather Paints

Typical outdoor test rack on which paint panels undergo two-year exposure tests in heavy industrial and seacoast areas. L-M has paints constantly under test—in the laboratory and outdoors.

In the laboratory, paints are subjected to standard tests and special exposures to salt spray and acid fumes which simulate and accelerate atmospheric conditions. From this continuous and extensive testing program L-M selects the paints that best survive these rigorous tests.

Get Complete Information On L-M Round-Wound Transformers

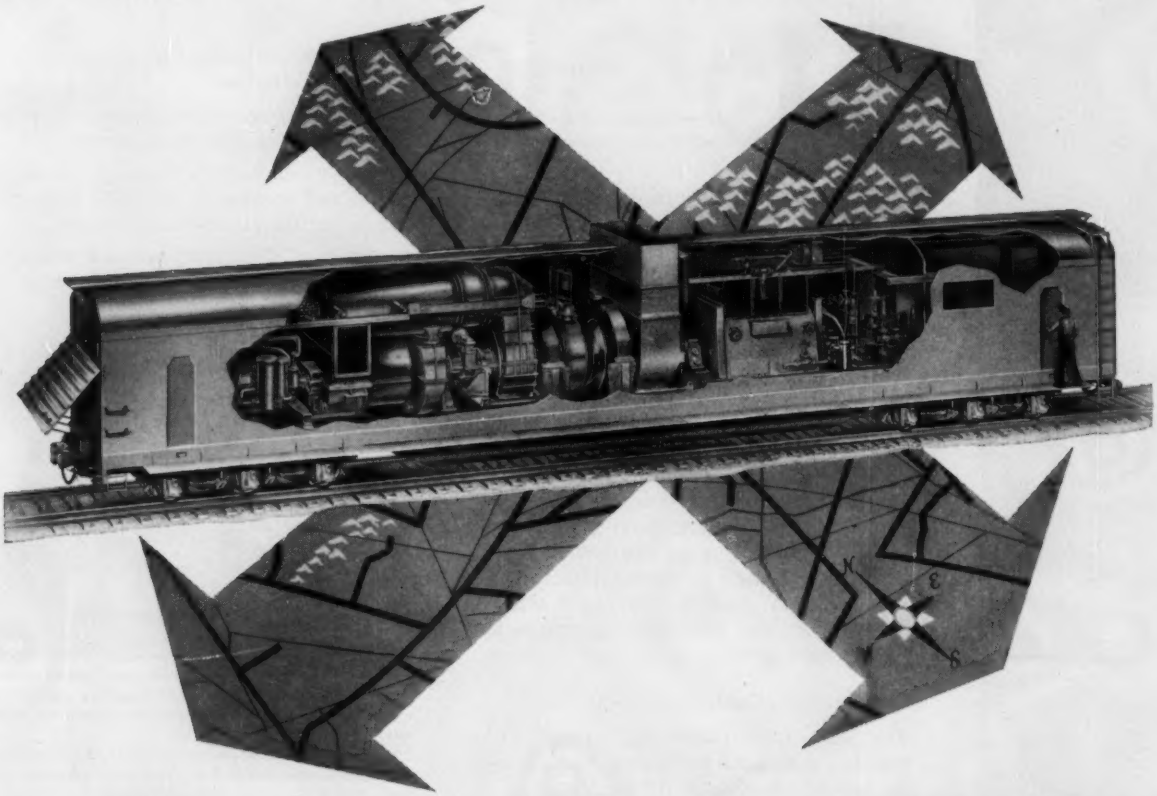
Tank protection is only one of the important features of L-M Round-Wound transformers. Other advantages are exceptional overload capacity, good regulation, low losses—and *Balanced Performance*. Ask the L-M Field Engineer for complete data, or write Line Material Industries, Transformer Division, Zanesville, Ohio.

Flow-coating with highest grade weather-resistant paint
Finish
Final baking insures long resistance to even the worst atmospheres
Vapor-Chamber Flow-out

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Transformers

McGRAW EDISON

KILOWATTS



...where and when you need them

Heavy temporary electrical loads out at the end of the line present a serious problem to most electrical utilities particularly when the industry served is an important one.

There is, however, a practical answer to peak loads or emergency needs . . . the Clark Turbo-Mobile Power Plant. This gas-turbine-driven unit is a completely self-contained, rail car mounted, generating station. Burning liquid or gaseous fuels, it can generate up to 6,750 KW, measured at the generator terminals, anywhere that there are railroad tracks. And whether the "temporary" demand lasts for a day or a year doesn't matter. The Clark unit is designed for continuous 24 hour a day service for as long as required.

Stationary gas-turbine-driven generating units can also be provided. When equipped with a regenerator, a thermal efficiency of 29% is achieved at a KW output of 6,200. When used in a combined cycle, with the exhaust gases generating steam in a waste heat boiler, up to 10,000 KW can be generated at a thermal efficiency of 29%. Both efficiencies are based upon the fuel's low heat value.

Clark engineers are available to analyze your specific applications with regard to portable or stationary gas-turbine-driven generating equipment. Consult your nearest Clark representative.

CLARK BROS. CO., OLEAN, NEW YORK
One of the Dresser Industries
Offices in Principal Cities Throughout the World

CLARK **Portable Generating Equipment**

This $2-a-year Penta-treated pole plant...

Clean, easy to handle Penta-treated poles *and* crossarms mean economy all along the line... for years to come! Costly material and labor charges for replacements are virtually eliminated. Because of Penta-treated wood's long-term resistance (35 years!) to decay and termite attack, your actual cost per year per pole plant is very small.

Let's take a look at this typical distribution pole plant cost breakdown*:

35′ Class 5 Penta-treated pole	**$24**
3¼″ x 4¼″ x 8′ Penta-treated crossarm	**4**
Hardware	**5**
Labor and equipment to install pole plant	**37**
	$70

OR, $2 per year per pole plant based on a 35-year life expectancy.

...Can save you $100 in 10 years or less!

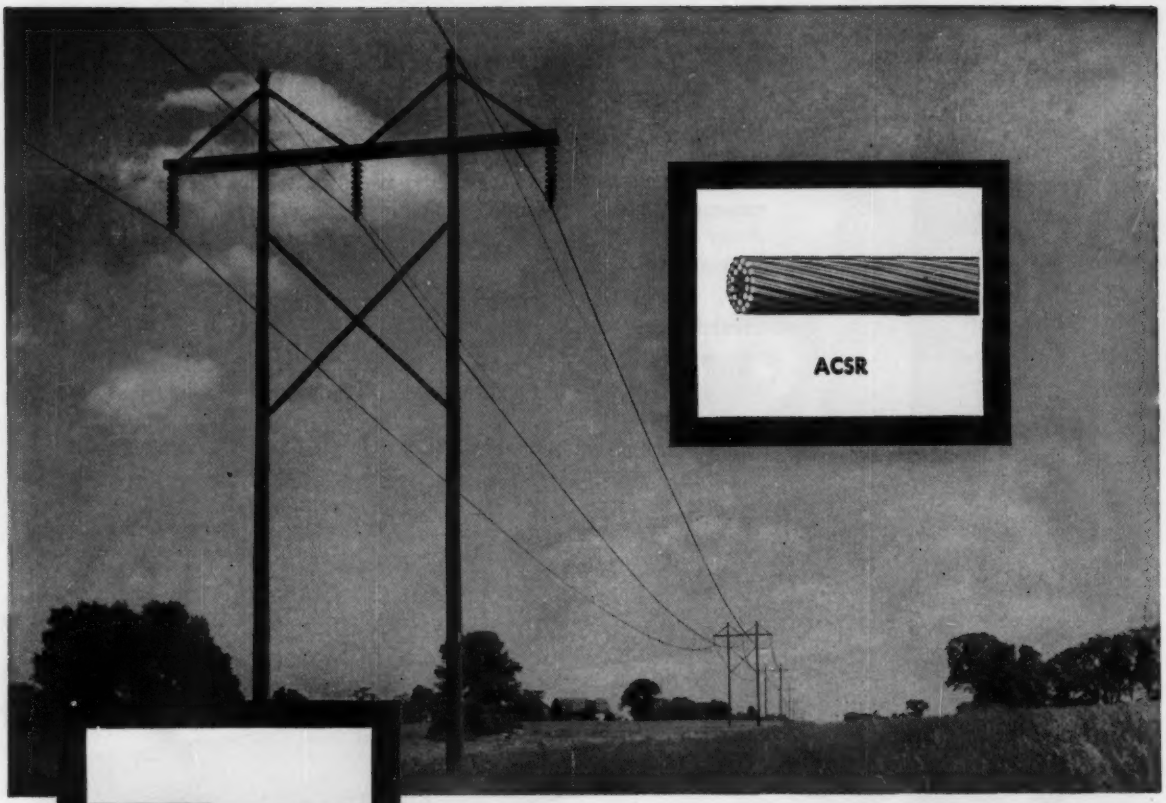
Crossarms as well as poles should be Penta-treated. Then crossarm life will match treated pole life. Untreated crossarms usually must be replaced within ten years or less. Installing a Penta-treated crossarm in the first place will save the entire cost involved in removing and reattaching transformers, capacitor racks, etc. These factors considered, replacement costs could well exceed $100—*actually more than the cost of the entire pole plant itself!* For maximum economy, specify Penta for your *whole* pole plant.

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Dept. PI-14, 800 N. 12th Blvd.
St. Louis 1, Missouri

MONSANTO®

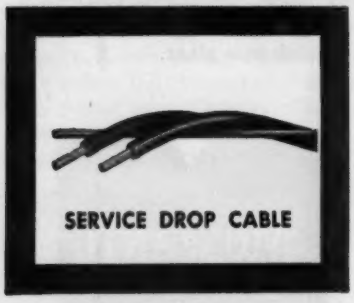
WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

*Average estimated costs.



GENERAL CABLE

ALECTRAL ALUMINUM CONDUCTORS



Consistent, outstanding performance mark General Cable's ALECTRAL Bare and Insulated aluminum conductors. Manufactured to General Cable's high standards in all sizes. Bare ACSR and aluminum • Weatherproof aluminum and ACSR conductors • All types of service drop cables. ALECTRAL is available with a complete range of paper, rubber and thermoplastic insulations, backed up by over 75 years of General Cable's engineering and manufacturing experience.

GENERAL CABLE CORPORATION
420 Lexington Avenue, New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast

for quality and service . . . specify **GENERAL CABLE**

P. P. #66200
6" STRAIN INSULATORS
EEI-NEMA CLASS 52-1

RECOGNIZED RELIABILITY

LOOK AT IT *FROM EVERY ANGLE*

Our insulators are the ultimate in design — **FIELD TESTED** and **FIELD PROVEN,** assuring ruggedness and durability.

There's more working space between the edge of the skirt and center of stud eye; extra long clevis pin to aid linemen in construction and Hot Line maintenance; highest quality Forged Steel or Malleable Iron, double dipped, hot galvanized hardware components — dimensionally standard facilitating complete interchangeability.

Prior to assembly all shells are **DOUBLE TESTED** electrically, 3-5 seconds of high frequency plus 3-5 minutes of 60 cycle flashover. After assembly each unit is Pull Tested to 50% of its rating (5000#), then given a **FINAL ELECTRICAL TEST** (12-15 seconds of high frequency flashover) prior to packing.

Look at it from **YOUR** angle — buy **RECOGNIZED RELIABILITY — BUY PORCELAIN PRODUCTS INSULATORS.**

PP INC.

Porcelain Products, Inc.
High Voltage Division **Parkersburg, W. Va.**

WHAT'S SPECIAL ABOUT LJUNGSTROM®

structural details?

. . . many things.

And all make air preheating with a Ljungstrom more economical, less troublesome. The Ljungstrom offers these refinements:

• The welded steel rotor is strong enough to support the heating elements without strain, yet flexible enough to withstand extreme temperature variations.

• An inspection port and strategically located access doors reveal any maintenance needs and make replacement work routine.

• A mass flow soot blower is installed as original equipment at the cold end where deposits are most apt to accumulate.

• The hot end heating surface is made from open hearth steel sheet and the cold end from heavier gauge, low-alloy corrosion-resisting material because corrosion is normally confined to the cold end.

The Air Preheater Corp. is constantly working to improve Ljungstrom heating surfaces, seals, bearings, and other structural details. And, in general, these improvements can be applied to existing units with only minor changes and at nominal cost. Another reason why seven out of ten air preheating installations are Ljungstrom. For the full story on how the Ljungstrom design and construction can cut your fuel costs, increase plant efficiency, write for our 38-page manual.

The Air Preheater Corporation, 60 EAST 42ND STREET, NEW YORK 17, N. Y.

The linking of these two famous symbols...

means Better Service

for users of treated wood!

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BRIDGE TIES
POLES
CROSS ARMS
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The American Creosoting Corporation, a pioneer in the development of the wood preserving industry has joined forces with Union Bag-Camp Paper Corporation—one of the nation's most progressive manufacturers of products from wood.

As a result, AMCRECO'S technical skill and experience, developed through half a century of serving the largest users of treated wood, is now reinforced by Union-Camp's resources.

Convenient plant locations, extensive resources and experienced personnel have been teamed to provide you with a new standard of service and dependability. This will be reflected in modernized facilities, improved deliveries (from stock in many cases) and careful attention to your specific requirements.

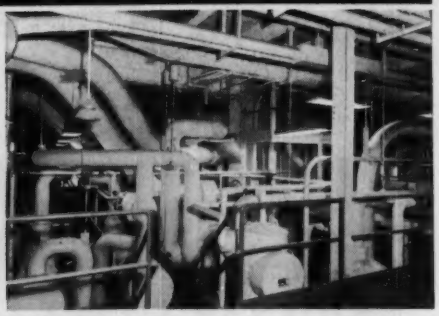
Let us show you how this new organization can be of help to you.

Time is Our Best Testimonial

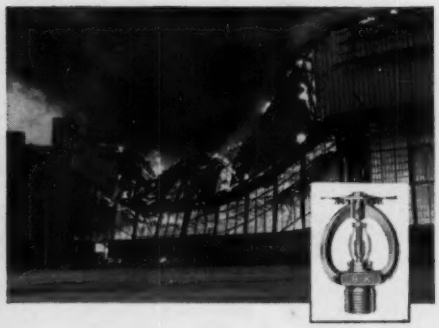
571

AMERICAN CREOSOTING CORPORATION
Louisville 2, Kentucky
18 Strategically Located Treating Plants to Serve You
Subsidiary of
UNION BAG-CAMP PAPER CORPORATION

BLAW-KNOX has what it takes—to provide these products and services



Heater piping system in this modern generating station is typical of many high temperature, high pressure systems prefabricated and erected by Blaw-Knox. Experienced piping engineers, modern shop facilities and a new Blaw-Knox digital computer method for fast, accurate calculation of piping stresses are available to you. Let us know your requirements and we'll provide the service you need. For more information, write for Bulletin No. 2443—"Piping for Industry."



Out of every 100 firms who lose their records in a fire, 43 never reopen for business. Be safe. Let a Blaw-Knox fire-protection engineer study your needs—and explain how you can pay for the system on our lease or deferred payment plan. To get more information send for Bulletin No. 2426—"Fire Can Destroy Your Business."

Blaw-Knox trapeze functional spring hanger installed in first large atomic generating station. Vital power piping system for the atomic generating unit in the Duquesne Light Company's Shippingport Station is supported by Blaw-Knox custom-engineered hangers.

Blaw-Knox makes a complete line of standard and custom-engineered pipe hangers, supports, and vibration eliminators. Each is a complete packaged unit, designed for a specific purpose and constructed to comply with the "code for pressure piping." Available in types and sizes to meet varying conditions, ready to install.

Blaw-Knox engineers, who have solved many difficult hanger and piping vibration problems, are always available to both design and make recommendations for your hanger requirements. For further information, write for Catalog No. 54.

BLAW-KNOX

BLAW-KNOX COMPANY

Power Piping and Sprinkler Division

829 Beaver Avenue • Pittsburgh 33, Pennsylvania

Complete facilities for prefabrication and erection of piping systems for all pressures and temperatures
...complete line of standard and custom-engineered pipe hangers, supports and vibration eliminators
...complete line of automatic sprinkler systems for standard and special hazards

Recent Regulator Advances call for a Reappraisal of the old question of which to buy . . .

REGULATORS OR LTC?

by D. D. MacCarthy
Manager—Engineering
Voltage Regulator Product Section

Selection of the proper type regulation usually boils down to dollars and cents. Recent improvements in single-phase step regulators, particularly G.E.'s ML-32 with its standard Load Bonus feature (increases current capacity by 60% at ±5% regulation with no loss of short-circuit capability), have changed the economic picture from what we have known it to be in the past.

It should be noted, however, that there is no "pat" answer as to which type of regulation should be used. Application specifications may call for single-phase step regulators, LTC transformers, three-phase step regulators, or induction regulators.

The charts at the right give the new economic picture for Load Tap Changer equipment and pole-type regulators on an equipment-first-cost basis. Additional factors, such as installation costs and auxiliary equipment, might modify this picture somewhat.

Figure 1 represents a 4-kv wye system. It shows that LTC provides ±10% regulation over a broad range. However, on circuits up to 3000 kva of load, the G-E ML-32 single-phase step voltage regulator offers substantial cost advantages.

Figure 2 covers a 12- or 13-kv wye system. Here, again, the same general relationship exists.

These charts show that the General Electric ML-32 single-phase step voltage regulator usually, within its range, offers *by far* the more economical type of regulation.

For more information on regulator economics, write Section 423–24, General Electric Company, Schenectady 5, New York, or contact your G-E sales engineer or agent.

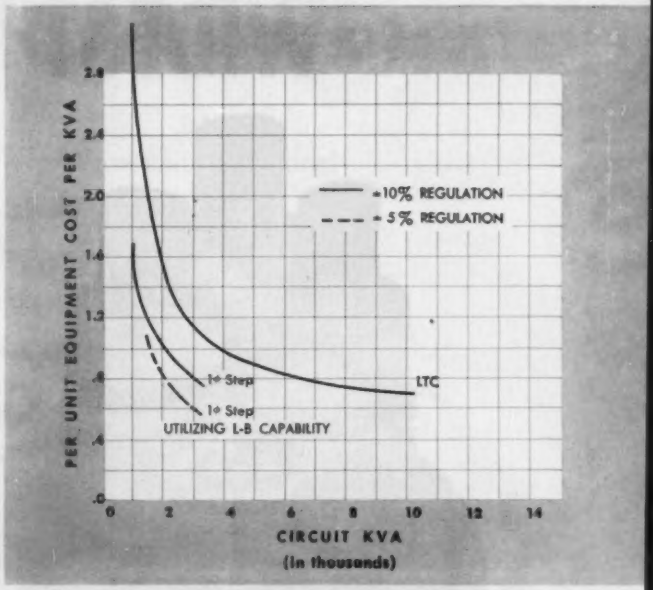


FIGURE 1. Regulating-equipment costs per kva plotted against load on a 4-kv wye-connected system.

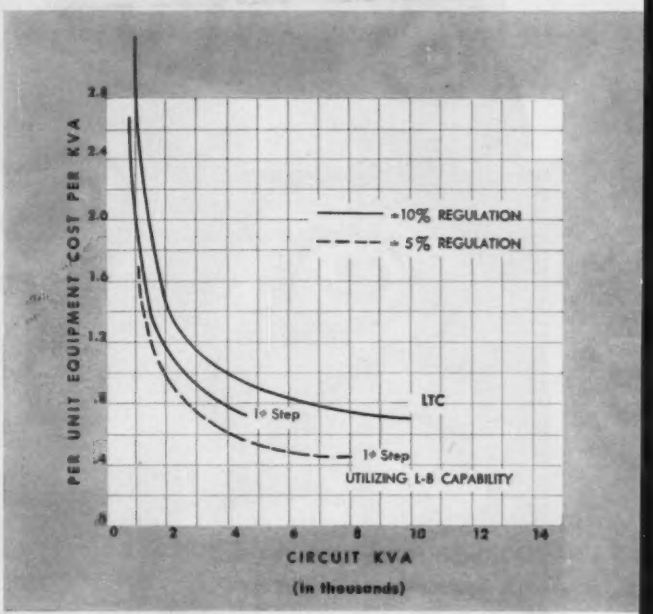


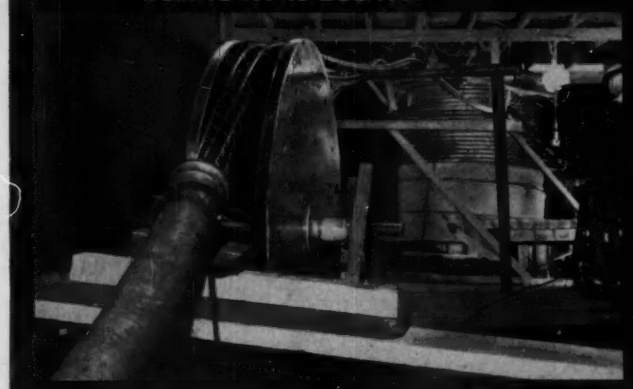
FIGURE 2. Per-unit costs for various regulating equipments on 12-kv or 13-kv wye systems.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Phelps Dodge
WIDEST RANGE OF HIGH

Pipe Type, Compression Cable, from 15 KV to 230 KV.

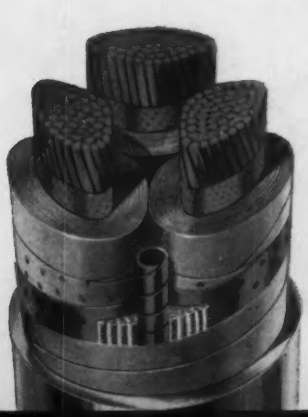


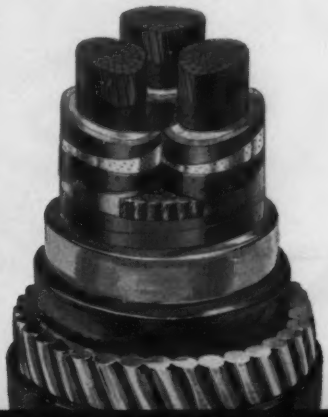
Low Pressure, Oil-Filled Cable, from 15 KV to 230 KV.

Consult Phelps Dodge for the correct answer to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.





Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.

Submarine Cable, from 15* KV to 35 KV.

Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

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300 PARK AVENUE, NEW YORK 22, N. Y.

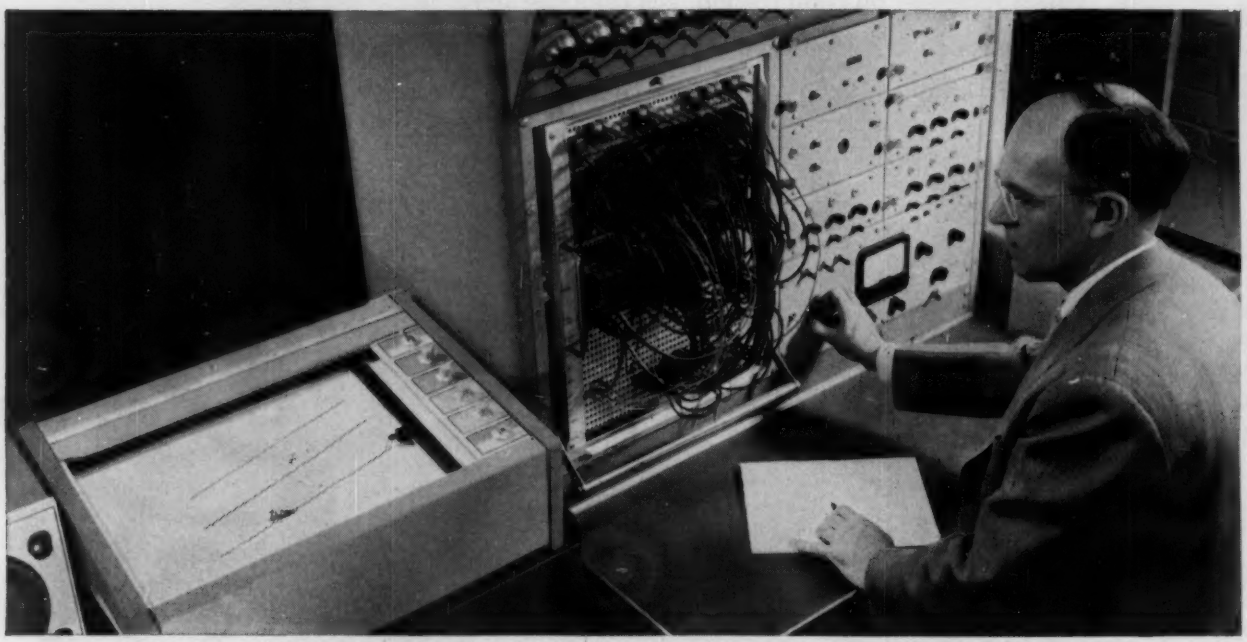
***PROVED:* WESTINGHOUSE *URL* AND *URF* REGULATORS**

Limit voltage error to 1/3 that

PROBLEM: Determine the combination of regulator components that will provide best regulation with greatest reliability, least maintenance

APPROACH: Analog computer to simulate operation of various controls and tap changers, and to evaluate the performance under conditions found on utility systems

ANSWER: Combination of 1¼% steps, inverse time delay, instant-response tap changer



H. L. Prescott, Development Engineer, Westinghouse Transformer Division, obtains regulator performance data with the analog computer. Conditions of an actual distribution system are reproduced—voltages of various characteristics are generated and applied to simulated regulators.

Extensive studies at Westinghouse with the analog computer have proved this fact of outstanding importance to every electric utility . . . the Westinghouse system of 1¼% step voltage regulation holds set voltage with ½-⅓ the voltage error of any other regulator! Tests compared two major systems (table, right) of step regulator operation, with a ± 1-volt setting, under the three basic supply voltage conditions—smooth changes, large and rapid changes, irregular changes. Results proved that the ability of a regulator to hold a set value is dependent on the kind of voltage sensing device, time delay control and tap changer. Results proved—and without exception—that Westinghouse 1¼% step regulation holds narrowest effective bandwidths, regardless of individual system characteristics.

To the utility, Westinghouse regulation means greater revenue for these reasons:

1. From feeder to customer—fewer operations, fewer regulators, minimum total regulation equipment expense.
2. Satisfactory voltages can be furnished farther out on the line without reregulation.
3. Heavier loading of existing lines is practical.

COMPARE:

A—Westinghouse regulators with 1¼% steps, inverse time delay, instant-response tap changer

B—Other regulators with ⅝% steps, fixed time delay, 7-second tap changer operation

Regulator	Set Time Delay	Maximum Voltage Error	Voltage Error Average
A	minimum	1.15	.20
B	15 second	1.22	.62
A	average	1.21	.25
B	30 second	1.28	.65
A	maximum	1.23	.29
B	60 second	1.34	.63

# of other regulators

G. K. Anderson, Voltage Regulator Sales, points to URL regulator whose superiority has been proved in service through thousands of installations for over ten years.

WESTINGHOUSE URL AND URF DISTRIBUTION VOLTAGE REGULATORS MEAN 42% FEWER OPERATIONS, 15% LESS CONTACT EROSION, FAR LESS MAINTENANCE

Providing these and many other advantages, the following features give you, altogether, the most practical regulators you can buy.

- Instant-response tap changer operates 15 times faster than other tap changers.
- Direct-drive Geneva gear mechanism provides optimum contact speed—eliminates flashover, minimizes contact burning, reduces erosion and carbonization.
- Load range selector—allows higher currents at reduced range operation; you get increased capacity to 160% of rated current at ± 5% regulation up to 400 amps.
- Coastal finish and single-bolt tank construction with no external hardware—maximum protection against corrosion.
- Separate tap changer oil compartment keeps metal and carbon from tap changer out of core and coil—eliminates core and coil maintenance.
- Unique new CVR relay with integral, adjustable, inverse time delay in drawout Flexitest* case.
- Unit assembly of core, coil and tap changer.
- Draw stud bushings with single-bolt cover simplifies untanking (though rarely necessary).

*Trade-Mark

NEW URF STEP VOLTAGE REGULATOR, DEVELOPED AS A RESULT OF THESE EXTENSIVE STUDIES, HAS THESE ADDITIONAL FEATURES:

1. Higher current ratings—extends range of 1¼% step regulator.
2. Built for feeder application—reduces your initial investment for regulators up to 167 kva.
3. Provisions for hand operation.
4. Bridging-type contacts with magnetic yoke eliminate pitting under short circuit, provide maximum mechanical strength.

J-70819

YOU CAN BE SURE... IF IT'S Westinghouse

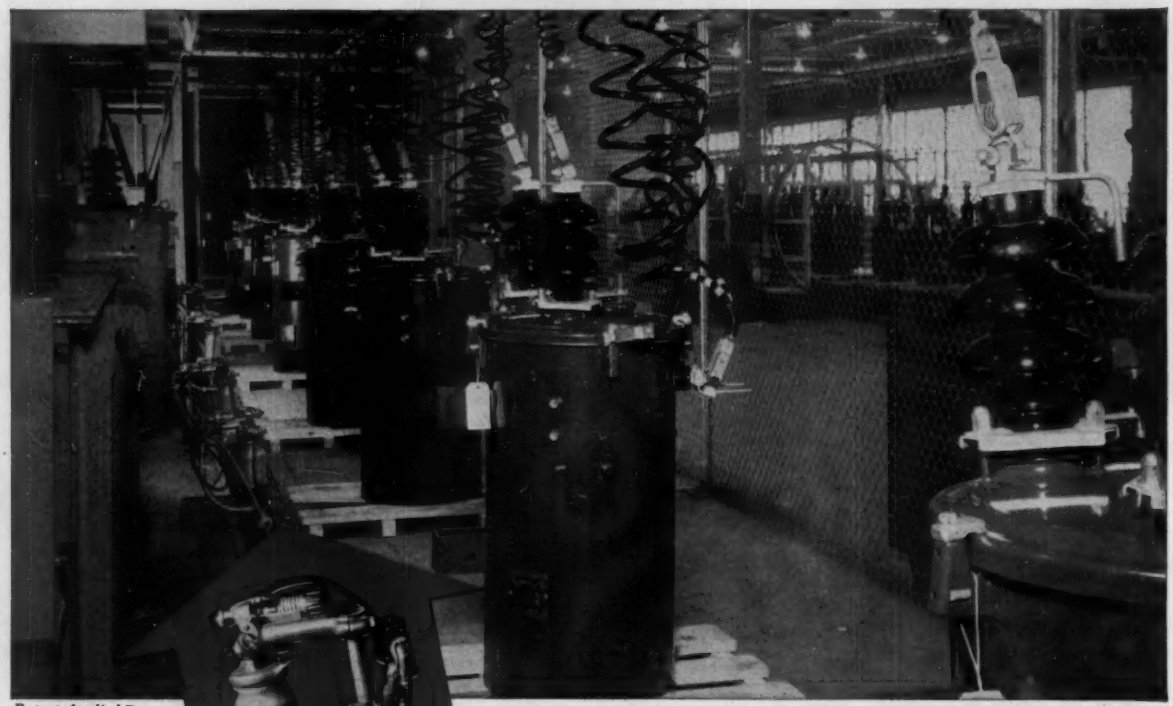
AT MOLONEY . . .
WE DON'T LIKE POLKA DOTS

And here's why . . .

Moloney's new automatic test system records each transformer's case history as it goes through the line. Occasionally, in spite of us, one 'flubs its dub'. When this happens a small jet automatically sprays a spot of color, which looks somewhat like a polka dot on the transformer tank.

This procedure insures against crating and shipment of a substandard transformer, but it also means that the transformer in question gets sent to our research and development laboratory. Once there, we want to know why, and won't stop until we *do know*. Analysis of the findings concerning these occasional failures does much to minimize the possibility of recurrence. At the same time our automatic test facilities assure the utility that only transformers capable of top performance are shipped.

MEB7-8



Patent Applied For

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers Transformers and Inductors for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Silence Has Ceased to Be Golden

The Federal Power Commission has ruled that publishing expenses, incurred by power companies in defending themselves against invasion of the power business by federal agencies, are "political" in nature and not a legitimate business expense.

The effects of this ruling touch importantly on fundamental freedoms of expression and of business to defend itself against unfair competitive practices. They will not long remain unrecognized.

Already the press, noted for its long and staunch defense of its own freedoms, has denounced this latest effort to silence an embattled industry. It would not be surprising if electric companies, denied the right to publish its story as a business expense, do not find themselves overwhelmed with offers of newspaper and magazine space to tell its story.

The issue is larger and vastly more fundamental than the matter of accounting that brought it about. The funds involved are minor indeed. And it is a matter of little practical consequence either financially or from a rate-making standpoint whether they are booked as operating expenses or not.

But what *does* matter is whether this politically inspired effort to silence the defense of the electric utility business shall succeed, based as it is on a false premise.

The theory behind the Commission ruling is the mistaken one that the costs of publishing facts in defense of investor-owned power companies are *not* a business expense. This theory overlooks the fact that electric companies are public service organizations; that their existence depends on public favor; that they cannot live, grow and hold their markets in the face of public antagonism engendered by propaganda that the government can do it better and cheaper.

This, then, is the issue: Shall federal power advocates in government, using postal privileges and federal printing presses, be permitted to kill off with propaganda a legitimate private business gagged by a rule that the cost of its own defense is political and not a legitimate business expense?

In the face of such an issue, silence has ceased to be golden.

Rates for Federal Loans Go Higher

The Administration's plan to introduce and back a bill to bar government agencies from lending money at rates lower than Treasury costs, makes sense!

The bill will have its most direct effect upon electric cooperatives which, since 1944, have been able to borrow funds at an interest rate fixed by law at 2 percent. This rate, which was set at a time when the government was getting money at very nearly 2 percent, no longer reflects true money costs. Today the Treasury must pay an average close to 3½ percent to borrow. It is therefore reasonable that this increased cost be passed on to those who borrow federal funds.

The proposed increase in federal interest rates comes more than 20 years after REA was formed to lend funds to electric cooperatives. Today it finds most cooperatives firmly established and strong enough to assume the extra cost burden without undue hardship.

Similar interest rate increases have been imposed by other government lending agencies. The Small Business Administration and the Export Import Bank already charge rates higher than the Treasury pays for its borrowings. Thus the proposed higher rates will have the effect of putting the financial and business dealings of electric cooperatives on a basis more nearly comparable with industry and business, generally.

We believe that the reasonableness of the President's proposal, the circumstances and timing of its presentation in the economic life of the electric cooperative program, and the self-sufficient stature that it imparts is worthy of support by all cooperatives.

At EEI Meet Industry Leaders Honor Sporn's Company as . . .

American G&E Wins Coffin Award

American Gas & Electric Co again won the coveted Charles A. Coffin Award, the electric industry's highest honor, in recognition of an outstanding contribution to advancement of the industry and service to customers.

President Philip Sporn, second from left, above, accepted the award on behalf of his company in one of the highlights of the recent Edison Electric Institute convention held in Chicago. He's joined by Phillip D. Read, left General Electric Co board chairman; Donald S. Kennedy, EEI president; and Robert Paxton, right, GE executive vice president. Other highlights:

- Four Utah Power & Light Co linemen won the Claude A. Matthews Valor Award for courage displayed in restoring a vital communications link.
- Northern States Power Co walked off with the grand award in the Reddy Kilowatt annual report contest.
- Donald S. Kennedy was re-elected president and J. Wesley McAfee was re-elected vice president of the institute.
- Fourteen speakers delivered talks on a variety of subjects of current interest to the electric utility industry. These speeches will be covered in the June 24 issue of Electrical World as a part of a comprehensive 16-page special report.

This is the second time that American G&E has taken the Coffin Award in recent years. In 1954 the company won it for contributions to generation and transmission technology.

This year AG&E was cited "For imaginative, courageous, and successful pioneering in engineering design and construction, resulting in systemwide transmission at 345 kv, steam pressure of 4,500 psi, and generating units of 450 Mw—thereby producing transmission and thermal efficiencies higher than any previously attained in the industry."

OVEC Accomplishments Praised

Other primary considerations were the company's "Leadership, through the Ohio Valley Electric Corp, in supplying to the Atomic Energy Commission the largest single block of electric power ever contracted for, in less than the estimated time and at less than the estimated cost; outstanding employee and management training programs; and for resourceful development of domestic energy consumption through the heat pump and other major appliances."

Appalachian Electric Power Co, Indiana & Michigan Electric Co, Kentucky Power Co, Kingsport Utilities Inc, Ohio Power Co, and Wheeling Electric Co are operating companies of the AG&E system.

In addition to technical accomplishments for which it is widely noted the company has initiated an extensive, comprehensive personnel development program. Objectives of this program are to provide experience and training which will enable the individual to perform present duties more effectively and prepare him for advancement, to develop individual capabilities of members of management groups, and to assure a supply of selected and trained personnel. Among tangible results of this program, the Award citation listed these: A flexible and versatile management group, high employee morale, cost reduction, an excellent safety record, and low personnel turnover.

The citation also commended AG&E for load-building activities which have resulted in a 154% increase in average domestic consumption from 1946 to 1956. Average use nationally rose 123% over the same period. The company's promotion of space heating and air conditioning, particularly through

use of the heat pump, also was recognized by the Coffin Award judges.

Utah P&L Men Get Valor Award

The Claude A. Matthews Valor Award for 1956 went to Utah P&L employees Dayton L. Kelly, line foreman; O. Maron Oveson, line working foreman; and Linemen John Griffone and George A. Bryner.

The act of valor took place on Feb. 1 and 2, 1956, when an important telephone circuit of the Salt Lake City utility failed in mountainous area between Price and Soldier Summit, Utah, at 7,000-ft altitude. This is the only communication link between Salt Lake City dispatchers and the 66,000-kw Carbon Steam Plant at Castle Gate. The link is "extremely important" in successful operation of the interconnected system.

Kelly and Griffone set out by foot to reach the breakdown and, after repairing it, lost their trail on the way back. Bryner and Oveson went searching for the missing men. The four reached safety the following day, two of them suffering frostbite.

"Through the courage, perserverance and devotion of duty exhibited under extremely hazardous conditions," the citation reads, "these men exemplified the highest traditions of electric utility public service."

Grand award in the 18th Reddy Kilowatt annual report contest went to Northern States Power Co for what the judges cited as a "A well-rounded, well-balanced, and very complete report." The citation further said the report "made good use of color, illustrations, statistical tables" and that it had "good layout and was easy to read."

The award was presented by Ashton B. Collins, founder and president of Reddy Kilowatt, Inc. Accepting on behalf of Northern States Power Co was President Allen S. King.

Four Companies Earn Reddy Kudos

Four other electric companies received certificates as winners in four different meter classifications. New York State Electric & Gas Corp was the winning company among those with more than 400,000 customers; Oklahoma Gas & Electric Co won in the 200,000-400,000 classification; Southwestern Public Service Co, Amarillo, Tex., was selected among companies with 100,000 to 200,000 customers; and Hawaiian Electric Co, Ltd, was named winner from companies with less than 100,000 customers.

A special award for greatest improvement in its 1956 annual report over that of 1955 went to Duke Power Co, Charlotte, N. C.

The bronze commemorative plaque was presented to Northern States and certificates to the other winners. For Northern States advertising department, this has been something of a "grand slam" year. It participated in putting together the award-winning report. And last month the Northern States advertising department walked away with seven awards in the Public Utility Advertising Association's better copy contest—the greatest number of PUAA awards won by any single utility.

Among the record number of report entries this year, judges noted "forthright statements of top utility executives on such vital points as customer relations, financial requirements, area growth, and the companies' construction programs." They also mentioned emphasis placed on sales programs and employee benefits.

Physical presentation of the reports, with generous use of color, more effective type arrangements, and easily-understood tables and charts was praised by the judges, who pointed out that because so many women now hold stock in power companies this appeal is important.

Re-Elections Are Unanimous

In announcing the re-election of Kennedy and McAfee to the top EEI posts, nonimating committee, Chairman Kinsey Robinson, Washington, Water Power Co, said the team was asked to serve another year because of the organization's busy schedule, its relatively new staff organization, and the hard task of moving to a new building in New York. The re-elections, Robinson said, had the unanimous backing of both the nominating committee and the EEI board of directors.

MEN OF VALOR: Utah P&L men won Claude Matthews Valor Award for restoring phone circuit. From left, Dayton L. Kelly, O. Maron Oveson, John Griffone, and George A. Bryner

ANNUAL REPORT WINNER: Pres A. S. King, center, Northern States Power, receives award from Ash Collins, Reddy Kilowatt Inc president. G. W. Ousler, EEI awards head, watches

Congress Tightens Control on AEC

Bill reported out by Joint Committee on Atomic Energy is, in effect, already law. It requires Congressional approval on AEC contracts for atomic power plants. Yankee and PRDC status is left in doubt

From here on the Atomic Energy Commission is going to have to clear with Congress its contracts with industry for development of atomic power plants—and also submit for Congressional review its own projects for power reactors.

Conforms to Cannon's View

This is the sense of a bill reported out last week by the Joint Committee on Atomic Energy after consultation with the AEC. The bill amends the Atomic Energy Act so that its language conforms to the interpretation made last April by Rep Clarence Cannon (D-Mo.), chairman of the House Appropriations Committee. Cannon questioned the legality of AEC's financial aids to industry power reactor projects for the past several years.

The new bill sponsored by Rep Carl T. Durham (D-N.C.), chairman of the JCAE, puts AEC in the same category with regard to construction funds as the Bureau of Reclamation, Corps of Engineers, and other government agencies. The commission will have to obtain approval for each project from the Joint Atomic Energy Committee. After the authorization becomes law it will have to go back to the Appropriations Committee for funds for authorized projects.

Six Projects Up for Approval

The bill is expected to become law quickly. In the meantime, the JCAE has up for its approval six proposed projects in the authorization measure on which public hearings began last week. The committee, in effect, is acting just as though the new bill is already law.

AEC is seeking authorization to go ahead with these projects: Yankee Atomic Electric Co, Power Reactor Development Co, Consumers Public Power District, Elk River Co-op, Wolverine Co-op, Piqua (Ohio) Municipal, and Chugach (Alaska) Co-op.

The status of Yankee and PRDC is in some doubt since AEC already has signed contracts with these two groups. There is a question, still to be resolved, whether they should be included in the current authorization bill and how much money should be allocated to them. This decision is up to the committee—and it can vote these projects up or down, regardless of the fact of the AEC contracts signed by both parties. Odds favor approval of the other four projects, since they are all public power groups involved.

Limited Commitment OK'd for '58

The authorization bill also has a new Section 111 which gives authority to AEC to make limited commitment during the course of a fiscal year. For instance, in the case of the current bill, $50 million would be authorized for AEC during 1958 for small projects AEC anticipates will be proposed but the details of which it does not yet know. All such cases, however, would have to be reported to the JCAE.

With way now cleared for Congressional action this year on the civilian reactor program, Durham also cleared up doubts about the status of the Gore-Holifield reactor bill, as such. It won't be pushed this year. The measure, which would have provided $400 million for a federal reactor construction program, will not come up for consideration this year, said Durham.

Instead, Durham indicated, federal reactor construction may be forced into the authorization bill that is now the committee's current business. The Democrats may not approve AEC authorizations for private industry projects without also insisting on some federal reactor projects. What Durham has said points strongly to this possibility.

The Durham bill specifically amends Section 261 of the Atomic Energy Act of 1954. This is the section under which Cannon charged that AEC was evading its obligations with respect to atomic electric power. The new Section 261 spells out the types of reactors—electric power, process heat, propulsion—for which AEC alone, or in partnership with industry, must obtain specific clearance.

Development Control Included

The new bill contains another feature aimed at providing greater Congressional control over any contracts AEC signs to assist industry in developing reactors.

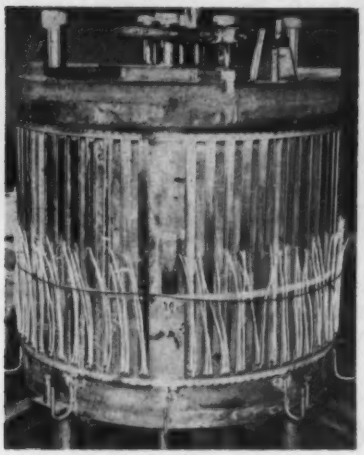
The commission in the future must clear with the JCAE any guaranteed fuel or by-product prices, fuel waiver charges, and guaranteed price periods it offers industry.

In connection with the latter, there have been frequent charges, especially in the case of the Power Reactor Development Co project, that AEC is offering subsidies to industry in the form of fuel charge waivers, extra high prices for by-products (plutonium in the case of PRDC) and unnecessarily long terms for price guarantees or waivers.

Insurance to Get Fast Action

With this phase of the atomic power legislation well on the way to being cleared up, Durham has also moved to get rapid action on the indemnity insurance bill. He has asked the Rules Committee to schedule the bill for early House action.

Bill would provide $500 million federal insurance on all atomic power projects.



AIRCRAFT REACTOR core hit 2,500-kw peak, Union Carbide announces. The 3-ft high, 33-in.-diam unit was designed to operate at 1,500 kw

Trend Is Up for Plant Costs

Recent trend of revised cost figures on nuclear power plant projects reflects the mounting expense of building and operating nuclear facilities. Escalating cost of materials is a major reason for higher estimates.

Some recent revisions include:

Indian Point—Power cost is estimated at 12 mills per kwhr for the 275,000-kw New York plant by Consolidated Edison Co of New York and prime contractor, Babcock & Wilcox. This compares with 7.5 mills for Con Ed's Astoria steam plant. Nuclear plant cost is set at $57 million. Superheater will cost $13 million. Unit cost of nuclear capacity will run $350 per kw.

Argonne National Laboratory—Operating cost of Experimental Boiling Water Reactor is estimated to be 52 mills per kwhr, based on AEC's cost figures. This includes a credit of 5 mills for plutonium produced.

Yankee Atomic Electric Co—Original estimate of $35 million will be exceeded by a "substantial margin," Yankee Atomic Electric Co now believes. The increase indicates power cost range of 12 to 14 mills per kwhr vs 10 to 12 mills previously predicted.

NUCLEAR NOTES

Homogeneous type has promise "but we question if it is ready to be built today on a full-scale basis." This conclusion of Nuclear Power Group is based on a study in cooperation with Babcock & Wilcox of homogeneous reactor. Review of B&W's gas-cooled reactor study "indicates the possibility of greatly improved economics" the group added. Reasons: Suspension of graphite dust in gas and use of unclad ceramic fuel elements.

Japan studies GE proposal for a station comparable to the 180,000-kw Dresden Plant now under construction for Commonwealth Edison Co. The dual-cycle BWR proposal was made to Japan's AEC and interested utilities.

Substantial financial assistance, as well as technical, is almost a certainty if West Europe is to follow through with its ambitious plans for nuclear power development for the next decade.

We're in "early stages," of nuclear power research and development, W. Kenneth Davis, AEC reactor development division director, told an industrial research conference recently. There's a popular misconception that large-scale use of nuclear power to solve our energy problems is just around the corner.

New plutonium price scale has been announced by Atomic Energy Commission. It ranges from $30 to $45 per gram, depending on the Pu 240 content. Previously the price of the power-reactor by-product was set at $12 per gram. New prices are effective from July 1, 1962 to June 30, 1963.

More Gore bill opposition has been registered by American Bar Assn which officially decried the bills and recommended that any acceleration of U.S. atom program be accomplished through extension of present AEC power demonstration reactor program.

Rep Carl Durham (D-N.C.), chairman of the Joint Atomic Energy Committee, has predicted the bill and other legislation aimed at accelerating commercial nuclear power will not be considered by the committee this year. Authorization would have to come in AEC authorization bill due for public hearings in June, he added.

A "prolonged delay" in one of Atomic Energy Commission's research projects will slow building of fluid fuel reactors by private industry. Extended deadline to June 30, 1962 has been set for completion of such plants. If research doesn't proceed satisfactorily, another extension may be ordered. Delay stems from "non-nuclear defects" in experimental Oak Ridge reactor.

Underground reactor near San Diego, Calif., is expected to be completed before next February by General Dynamics Corp. Reactor will be set 15 ft below surface. It will be protected by earth on three sides; the fourth faces a canyon.

Industrial heat market is under study for AEC by Stanford Research Institute. Purpose: Show potential market for atomic reactors to supply industrial heat.

Labor problems of atomic energy field are investigated in National Industrial Conference Board study. Restrictive safety rules, protective clothing, premium pay for "hazard" areas, and other potential labor-management issues were studied in AEC installation contracts.

'Wet Waffles' in High Winds

"Structural steel bent like licorice candy straps" on Bonneville Power Assn's McNary lines; widespread power line damage affecting several thousand Dallas homes; a half-hour outage in East Aurora, N. Y. . . .

These reports of high wind and storm damage made the lion-like role of March seem tame compared to May and June weather.

Newspaper accounts said gusts of more than 100 mph caused 15 BPA towers to "wilt like wet waffles" in Eastern Oregon's Willamette Valley. Damage was estimated at $200,000. Temporary replacement of one of the two downed 230-kv lines was gained about four days after the June 6 thunderstorm. Wooden H frames were set by 40 crew members working in two shifts. However, service was uninterrupted.

A Dallas Power & Light Co man said line damage from near-hurricane winds and rain May 23, was more extensive than caused by an April 2 tornado, for which the company set damages at $58,000. Gusts of nearly 70 mph felled tree limbs. Lightning took its toll on transformers, too.

The May 23 date also brought trouble to East Aurora, N. Y. About 3,000 business and domestic customers were blacked out for more than half an hour. New York State Electric & Gas Corp said the power failure was the result of high winds that felled three feeders.

Sweden's New Condenser

One of the biggest outdoor synchronous condensers made will be installed in Sweden's Soederasen Station. The big 100,000-kva, hydrogen-cooled condenser is under construction by Allgemeine Elektricitaets-Gesellschaft. It will increase stability of the country's 380-kv transmission system.

Vital statistics: Rated voltage— 21.3 kv ± 5%, 50 cps; line charging capacity— 80,000 kva at 17.5 kv; rated speed—750 rpm; short circuit ratio—1.16; direct axis synchronous reactance—0.92; transient reactance—0.24; total losses at rated load—1,175 kw; total weight, assembled—630,000 lb.

The exciter will be arranged within the condenser casing. The unit will be started by an outdoor transformer.

Area Development Backfires

By order of the state's Public Service Commission a recently completed fertilizer plant on the outskirts of Indianola, Miss., will be furnished electricity by the Delta Electric Power Assn. The decision provides an ironic twist for Mississippi Power & Light Co. MP&L supplied much of the information and encouragement to the incoming firm, which reciprocated by requesting service from the power company.

The PSC, however, concurred with the co-op's brief that since the new firm was outside the city—1,000 yds from MP&L lines—and in Delta service area, power should be furnished by Delta.

Major Frederick Sullens, editor of Jackson Daily News, described the decision as "downright absurd." He deplored the PSC "denying a tax-paying utility the right to serve an industry it was instrumental in bringing to Mississippi and giving the business to a tax-free co-op that was brought into being only to serve farm homes."

Apaches Go on Dam Path

The White Mountain Apache Tribal Council has won a skirmish with the Salt River Valley Water Users Assn. Whether they've won the entire battle remains for legal pow-wows to determine.

It started when the Indians proposed a Smith Park (Ariz.) dam to form a 250-acre lake. The lake would bottle Trout Creek water on which the Water Users claim jurisdiction. The association obtained a superior court injunction which stopped the project —they thought.

After the debacle quieted, the Apaches closed the area to visitors, gathered heavy machinery, and started on the dam with tribal labor. Their goal: A fishing and resort facility that will raise revenue for council funds.

'It's Not the Money . . .'

A Congressional probe is underway in Little Rock, Ark., to determine whether the all-electric approach is in the best interests of taxpayers. The Solons are checking the charge of Arkansas Louisiana Gas Co that an air force base housing development could be furnished gas at $310,000 a year less than Arkansas Power & Light Co's electric rates.

"It's a matter of principle with us to prevent a loss to the taxpayers," said B. E. Harrell, the gas firm's general sales manager. He added that since they furnish gas to fuel AP&L plants, "We won't make anything out of it if we do get the business."

William Shepherd, AP&L vice president, countered by saying power plants are more efficient than that of an individual gas unit in a house. Besides, not all the appliances would be fueled in the gas company's proposal, he added. The electric company said Air Force and Defense Department investigations have already proved that electricity could be supplied cheaper than gas.

The housing development is slated to have 1,535 dwelling units, all of them heated and cooled electrically with heat pumps.

UTILITY COMPANY PRESIDENTS on panel (l to r) were: Albert Cage, California Electric Power W. T. Lucking, Arizona Public Service; R. B. Johnson, Hawaiian Electric; N. R. Sutherland, Pacific Gas & Electric; G. C. Tenney, McGraw-Hill Co of California; E. D. Sherwin, San Diego Gas & Electric; F. A. Tracy, Sierra Pacific Power; Harold Quinton, Southern California Edison; Reid Bardner, Southern Nevada Power Co. Each utility executive gave his views on "The Job Ahead"

Wants U. S. Out of A-Power Race

PCEA speaker sees international scramble boosting kilowatt cost to consumer; 8 presidents discuss job ahead

This country must stay out of the atomic power "kilowatt race" against Britain and Russia, the Pacific Coast Electrical Association was told at its 40th annual convention at San Francisco, Calif.

America is seeking ways to make nuclear power cheaper through development of various reactor types, said E. A. Vennard, managing director, Edison Electric Institute. Entry into a full-scale capability race, he said, would boost the cost of such power to the consumer.

A feature of the convention was a utility presidents' panel session, at which eight top executive of major utilities in California, Nevada, Arizona, and Hawaii gave their views on "the job ahead." Panel moderator was G. C. Tenney, president, McGraw-Hill Co of California.

This panel heard J. E. Corette, Montana Power Co, charge that America's "real give-away" program was promotion of tax-exempt federal power projects. Such projects, he said, rely on taxes paid by all and give benefits only to the few. He contrasted California's ample power supply, guaranteed by three private utilities, with the supply in Oregon and Washington, where the dominant federal agencies must frequently resort to curtailments.

R. E. Boian, manager, Live Better Electrically program, pointed to definite trend to off-site home construction spurred by the skyrocketing of on-site labor costs. The packaged electric kitchen, he said, is adaptable to this trend, opening a potentially huge market to the electrical industry.

Load Doubles Faster

Tomlinson Fort, vice president, Westinghouse Electric Corp, said that traditionally, load doubled each ten years, but since the war the doubling time has shortened to seven years. Proper approach to this load growth, he said, is to forecast ably, build toward the forecast, and plan, work, and sell to make the forecast come true.

J. E. CORETTE characterized federal power projects as "real give-away"

R. M. Feemster, chairman, Dow, Jones & Co, declared that advertising promotion expenditures must be increased. He noted, however, that utility ad budgets dropped steadily from 2.6% of gross in 1937 to 1.6% today. To match other industries' general pattern, he urged an increase to 4% of gross and extension of national promotions like Live Better Electrically to other customer areas.

That only ½% of electric customers feel service to be unsatisfactory due to interruptions is proof the industry has met its responsibilities, said Fischer Black, editor and publisher, Electrical World. But standard measures of service continuity must be established to prevent loss of future all-electric customers, he warned. Improved outage records will aid evaluation of such standards. Black recommended rating of system components in terms of outage susceptibility.

J. F. Craemer, California publisher and former member of the California State Public Utilities Commission, said that "public power yardstick" concept was derogatory of the ability of regulatory commission staffs. Yardsticks, he said, have always failed to measure the true value of electricity.

PEA Group Told Relaying Needs Updating

Bedford Springs meeting warned no inverse-time relay, even with the latest breakers, can prevent burndowns of open wire

PEA RELAY OFFICERS will change later this year. Marc Jansen accepts top job from J. A. G. Oewel, chairman. C. B. Woodward will be vice-chairman

Present equipment and methods of distribution relaying need considerable improvement to meet problems of the future, the Pennsylvania Electric Association Relay Committee was told during its spring meeting at Bedford Springs, Pa.

A. J. McConnell, General Electric Co, said that no inverse-time relay, even used with the latest circuit breakers, can prevent burndowns. This condition will be presented to more and more utilities as high-load-density areas appear. And substantial improvements in relaying generally will mean increased costs.

To minimize time-delay tripping on fast reclosing into a nearby fault, McConnell said, some companies use a second high-set instantaneous unit to trip at high speed above a current level at which time-delay tripping cannot be tolerated. To override inrush current without loss of reach on the reclosing of a feeder, a high-dropout instantaneous unit will allow a more sensitive setting than a low-dropout unit adjusted for a higher pickup, he said.

R. A. Zimmerman, Westinghouse Electric Corp, said adequate coordinated overcurrent protection of primary feeders requires automatic protective devices to minimize overall cost. Slated for elimination are devices such as fuses which cause unnecessary outages. He added that system design and construction practices must aim to minimize faults and sectionalizing points.

T. E. DyLiacco, Cleveland Electric Illuminating Co, said use of standard relay settings for "standard" 4.6-kv delta and 2.3-kv feeders, in place of hand-tailored calculations for each feeder, has not impaired operating performance. Relay standards based on feeder ratings provide settings which coordinate with fuses and station relays to meet both short-circuit and cold-inrush currents. Relay settings are selected as standard if by their use the number of non-standard settings can be minimized. A "standard" feeder is one which will take these standard settings.

In the development of these standards, said DyLiacco, the function of the overcurrent lock-out relay was redefined as being solely for equipment protection. This resulted in a simplified "universal" standard which requires no calculations.

Describes Recloser

An automatic, 3-phase oil circuit recloser with twice the interrupting capacity of the preceding model was described by F. W. McStay, Line Material Industries. He reported the greater load-carrying capacity and additional time-current characteristics available should extend the newer model's application.

Trends in generator protection from a survey of 22 Eastern utilities were reported by C. M. Jackson Duquesne Light Co, and S. E. Smith, West Penn Power Co. In a comparison of protection applied to the last unit installed with protection for the next unit, more utilities than before (95% of those reporting) will use negative sequence and loss of field relaying. Fewer companies will install overcurrent protection and motoring relays. Almost all will ground their next units through distribution transformers.

A trend in differential protection is to have a separate generator differential and an overall differential for generator and main transformer. Two more companies (15) than before will use pressure relays on the main transformer. Pennsylvania Electric Co reported it will use an electronic exciter for its next unit, its second such installation.

Specially trained personnel and a well planned test-maintenance program are basic to the success of a microwave system, said W. P. Magee, Philadelphia Electric Co. One year before installation of the Richmond-Camden microwave relaying system in late 1951, Philadelphia Electric trained four men who were familiar with the testing and maintenance of other electronic equipment.

Electronic components were maintained monthly for the first year and now quarterly.

Magee reported that overall average service life of 63 tubes of 18 different types is 7,200 hr. Replacement of certain tubes, which have a substantially shorter life, with industrial-type has brought encouraging results.

Operating experience with 960-mc microwave relaying and supervisory equipment was releated by D. R. Holland, Baltimore Gas & Electric Co. During six years of operation, random noise causing false operation of tone equipment was a serious problem. Two schemes were devised to monitor the receiver output level and block the tone receiver units on random noise. Holland reported that the supervisory control scheme definitely does not have the reliability of wire operation. Initial

reliability was enhanced through operation of the supervisory equipment from a station battery instead of a rectified power supply.

Better service from recent 6J6 tubes is obtained in part through better ventilation for equipment cabinets. Holland added that installation of microwave equipment well in advance of the in-service date is mandatory for proper on-schedule operation.

V. A. Nosko, CEI Co, said the trend to multi-terminal lines, while reducing the number of circuit breakers, continues to complicate protection schemes. For their zone-comparison, or permissive under-reaching scheme, CEI uses local fault detectors to initiate tripping. To insure proper relay operation on a three-terminal line which has one breaker in common with another multi-terminal line, equipment has been added to transmit continuously a signal from an open breaker.

For high-speed relaying of the Linden-West Orange 132-kv steel tower and pipe-type cable line, Public Service Electric & Gas Co chose a 960-mc microwave system, said I. D. Perry. Operating speed of microwave is fast enough to insure correct blocking. Use of carrier current would have involved expensive means of over-coming losses in the cable and mis-match losses. The long time constant of pilot wire and the potential exposure in going through six exchanges made telephone lines unsatisfactory for line relay blocking, said Perry.

Discuss Bi-Metal Connections

PEA speakers urge aluminum-copper connection lab tests based on field experience; talk also on conductor creep

Big problem in aluminum-copper connections is relating laboratory tests to field experience. With this problem in mind, a symposium of connector manufacturers at the Pennsylvania Electric Association Transmission & Distribution Committee meeting, Dallas, Pa., May 2-3, urged utilities to recommend types of laboratory performance tests based on existing field conditions and experience.

"The laboratory test," said R. L. Lock, Anderson Electric Co, "should duplicate the types of field failures." M. A. Leland, Burndy Corp, said the utility engineer must "help us relate a specific number of salt spray exposure hours to years of field service in a given area." He added that 2 to 5% salt concentrations appear to be more realistic than the 20% concentration used heretofore.

Scott R. Wheaton, Fargo Mfg Co, said the symposium is studying the effect of tension on conductor creep and bolt stresses. Members agreed that an unplated aluminum-bodied connector, massive in size compared to the copper conductor, with a liberal application of inhibitor over clean conductors is the best all-around choice for bi-metallic connections. This has been substantiated by laboratory and field experience, they held.

But Edward Ruch said Public Service Electric & Gas Co's practice calls for a non-plated, bronze, vise-type connector for bi-metallic connections up to No. 4. Inhibitor is applied to the joint, with the aluminum placed above the copper. Field use and outdoor test racks have provided satisfactory results, he stated.

Although the present trend in EHV is toward 345 kv, some utilities with 230 and 287-kv experience expect to hold off until 460 or 500 kv becomes economically practicable. This was reported by A. N. Shealy, Kaiser Aluminum & Chemical Corp. He said laboratory and field measurements of radio interference on EHV lines do not correlate as yet. Correlation of these data and more study of creep, aeolian vibration, and sleet loading are needed to guide selection of an economic conductor size. Concentrated effort is being made to develop a satisfactory spacer for bundled EHV conductors, as well as improved methods of field handling and installing conductors.

During a discussion of aerial patrol of transmission lines, it was established that helicopter patrol is faster and less expensive than foot patrol. Philadelphia Electric Co reported it saves $400 per month over ground patrol. Delaware Power & Light Co found its cost for a non-company pilot and observer in a light plane is 60¢ to $1 per mile. Pennsylvania Electric Co covers up to 1,500 miles of line in ten days, flying up to 7 hr per day in a helicopter.

Although the failure rate of conventional distribution transformers is decreasing, that of self-protected transformers trends upward, said H. R. Boyce, Duquesne Light Co. He compiled reports from ten companies in and near Pennsylvania. Total failure rate in 1956 for conventional 2.4 to 12.5-kv transformers was 0.68% and for self-protected transformers 0.44%. The upward trend among self-protected types was attributed to secondary faults and overloads.

2,500-Kw Peak Reached By 3-Ft Aircraft Reactor

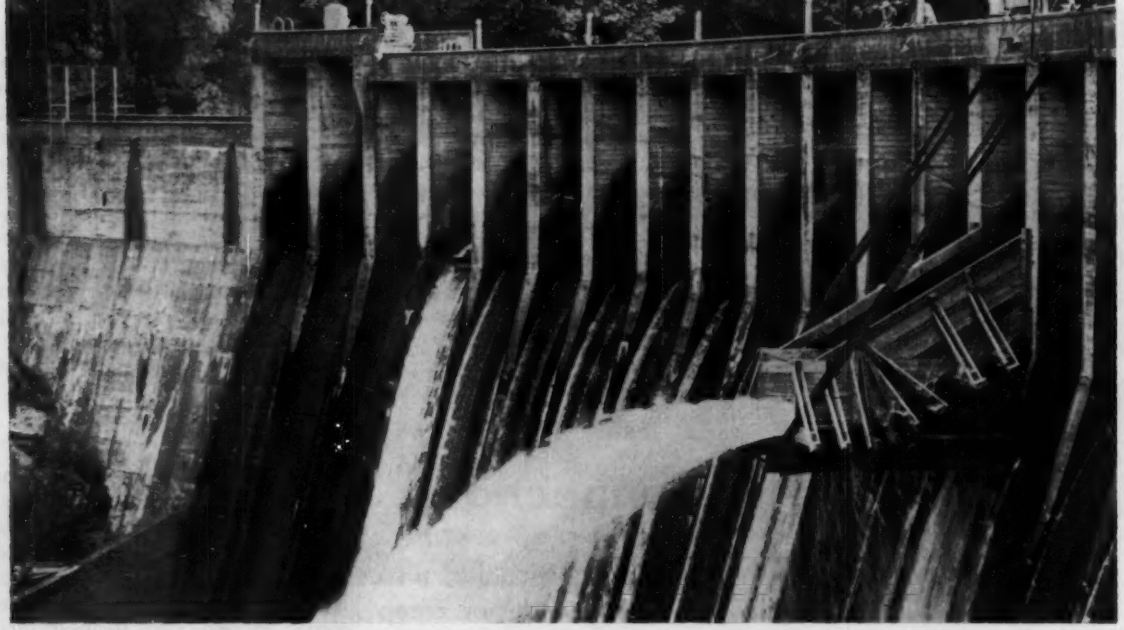
The Aircraft reactor core undergoing experiments at Oak Ridge National Laboratory is 3 ft high and has a 33-in. diameter.

Designed for operation at 1,500 kw, it actually ran at 2,500-kw peak, said Union Carbide Nuclear Co spokesmen. The Union Carbide Corp division operates the reactor for the Atomic Energy Commission.

Large tube at top is an outlet for the sodium heat exchanger unit. Smaller extensions represent two fission chambers (outer rim) and four regulating control rods.

Fuel flowed at 1,200 deg F in serpentine nickel-alloy tubes through the reactor where the system became critical, UCNC said. High-temperature centrifugal pump moved the liquid at about 1,500 deg F through a heat exchanger. Heat was rejected to water. Between the fuel system and water heat exchangers was a stream of recirculating high-velocity helium serving as intermediate heat exchanger fluid.

The reactor went critical in 1954, and ran four days and nights.



SKI JUMP WATER CHUTE helps fingerlings get downstream past a Puget Sound Power & Light dam on Baker River.

Some fish passed over dam were dashed to pieces hitting dam's face. Now they drop with safety into river below

Fish vs. Dams: What's the Score?

Both sides are winning as moves are made to end fish-dam conflict. But complete solution lies a long way off . . .

All work on Tacoma City Light's proposed Mayfield Dam on the Cowlitz River came to a dramatic halt last fall when the municipal utility sought to condemn a fish hatchery to be inundated by the new reservoir. Now City Light finds itself almost inextricably enmeshed in a bitter temper-trying fight that is breeding ill will on both sides.

At stake on the one side is a profitable run of salmon that a dam might jeopardize. At stake on the other is an adequate future power supply for a city which has increased its population to 157,000—a 13,000 gain since the 1950 Census.

Because of anadromous fish—the kind that return from the sea to spawn at their riverbed birthplace, hydroelectric problems are somewhat complicated by commercial fishing interests for a host of Pacific Northwest utilities. Progress has been made in overcoming some obstacles dams pose to fish, and there is growing belief that fish and dams can coexist.

But until much more progress is made, the salmon and trout problem will continue to cost utilities hundreds of thousands of dollars, plus intangibles that may color public attitudes unfavorably and multiply costs of expensive projects.

This is the position in which Tacoma now finds itself. Commercial and sports fishermen, regarding any dam as another nail in the coffin, intend waging a last-ditch fight for the Cowlitz. Tacoma has won repeal, in the state legislature, of a provision prohibiting cities from obstructing navigation with dams. The Washington State Sportsmen's Council demands this be put to a public vote, and is soliciting 50,000 signatures to force an election next year. It is generally conceded that a showdown election will be held.

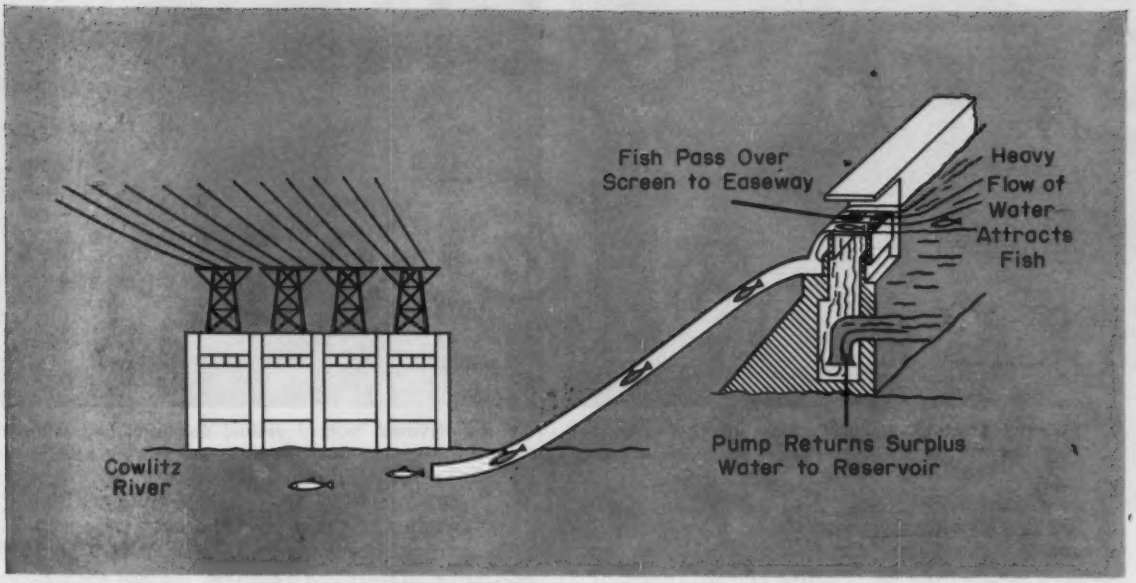
Tacoma still hopes to buy the hatchery, but now has started investigations to learn whether a lower dam is economically feasible. A lower dam might be more acceptable to fishermen and would not flood the hatchery. Such a study, of course, will increase the project's cost.

Fish also complicate a pending Federal Power Commission decision on Pacific Northwest Power Co's proposed Mountain Sheep-Pleasant Valley project. As an alternative, FPC's staff recommends a high Nez Perce dam which would block three major spawning areas—the Snake, Salmon, and Imnaha Rivers.

For Upstream Migration: Ladders, Elevators, Lifts

Some fishermen won't yield an inch, but others believe fish ladders pretty well have solved the problem of getting fish upstream. But the manner in which fish find these ladders often is haphazard. When they hit the turbulence below a dam, driven by an innate compulsion to swim upstream, they fight until they tire. As they tire, they drift toward the banks where they encounter attraction of a milder current from the fish ladder, and they proceed up that.

A device being tried at the McNary Dam is known as a pressure lift. Used extensively in Scotland, it is an inclined tube-like structure running down into a cage in the water. Fish enter the cage. Periodically water is



SKIMMER DEVICE is being hailed cautiously as a possible answer to downstream migration problem. Fingerlings, attracted by strong current near reservoir top, pass over screen, through pipe to river below—still headed seaward

sucked up the tube, carrying fish with it, discharging them above the dam.

A third device is Bonneville Dam's "elevator." Again fish enter a cage at the bottom of a shaft. Periodically a gate drops behind them and water in the shaft rises, lifting fish over the dam. But ladders, elevators, and pressure lifts are expensive, and the latter two require considerable electricity for pumping water. The major problem is that of attracting fish to the device.

This bred major research projects, largely financed by the Corps of Engineers, which dealt with use of lights, sound waves, magnetic fields, and electricity. Electricity appears the best "fish guider."

Two sets of electrodes establish an electrical field in the water on a diagonal or in the shape of a triangle. Upon hitting this field, fish recoil and seek to work around it. Eventually they wind up in the trap.

Idaho Power Co is using temporarily an electrode system at Brownlee Dam, now under construction. Rods carrying direct current span the river near the diversion tunnel mouth. Electricity forces fish into a trap on the riverbank. This trap is hoisted periodically and the fish are dumped into a 1,000-gal tank truck, hauled around the dam, and poured back into the river.

This scheme was put in, however, after the recent run of steelhead trout, so its true performance has yet to be evaluated.

For Downstream Migration: Skimmers, Ski Jumps

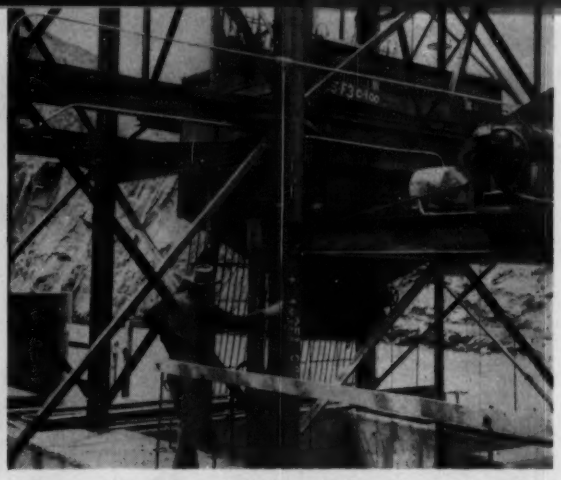
Now dam-builders and fishing interests are turning their attention upon ways of getting fingerlings downstream. Spilling them over the dam, or dashing them against turbine blades increases mortality. High dams pose bigger problems than low in this respect.

Part of Tacoma City Light's fish-research budget included cost of operating a skimmer device, which is being hailed cautiously as a possible answer to the problem. The skimmer is designed to catch downstream migrating fish on the top of the reservoir—where they almost always swim. It attracts them with a strong current of water. Most of this water is drawn off and returned to the reservoir. The balance carries fingerlings through a pipe to the river below the dam. But fish experts say at least two generations of salmon will be required to prove the effectiveness of the skimmer. So the confirmed value of this device will not be known for eight to 12 years.

MODEL OF PELTON DAM at Oregon State College helps Dr Roy Shoemaker, left, and Dr Milo Popovich test current flow for migration. Dr Popovich points to skimmer device at right

The "ski jump" water chute represents Puget Sound Power & Light's technique for moving fingerlings downstream. Experiments have shown small fish can fall up

AT BROWNLEE, Idaho Power Co has installed electrodes across Snake River to attract fish to a trap on the left bank



FISH are elevated, trucked around dam site, and returned to river. This temporary solution remains to be proved

to 300 ft with virtually no mortality if they fall in a stream of water into a deep pool. The water chute spouts a stream from the reservoir into the river 250 ft below, safely beyond the spillway base.

McNary, The Dalles, Ice Harbor, and Rock Island dams have no facilities for carrying fish safely downstream, but all use Kaplan turbines which have proved to be less harmful than the Francis type.

What Fish Runs Mean Financially

Today more and more utilities are adding ichthyologists to their payrolls, and are budgeting heavy sums toward solving fish problems. The importance of solving them becomes obvious when one considers these facts:

Average annual production of anadromous fish on the Columbia and its tributaries amounts to about 28,638,000 pounds with an average annual value of more than $17 million. Of this, chinook salmon amounts to about 22.2 million pounds valued at $12.8 million.

Of these totals, the Snake River in Idaho contributes about 33%, primarily chinook salmon and steelhead trout—the most valuable kinds.

Many utilities in the Pacific Northwest write off considerable sums to fish. Here's a scattered sample: The City of Tacoma says cost of fish facilities in its Cowlitz hydro project will run $7.1 million. Seattle City Light has contributed $58,000 for studies aimed at its Copper River development. Of this, $12,000 will go into a $200,000 Corps of Engineers experiment at creating artificial spawning grounds. Pacific Northwest Power Co will contribute $48,000 to this project, bringing to about $150,000 the amount already allocated by PNP for fish studies. The federal government also will contribute to the artificial spawning ground experiment. PNP also has advanced over $100,000 to Oregon, Washington, and Idaho fish and game agencies and the U. S. Fish & Wildlife Service for various studies related to the Mountain Sheep-Pleasant Valley project. Portland General Electric reports that $5 million of its $25-million Pelton project is going into fish protection, and $1.5 million of the $22-million North Fork project.

So fish pose a real economic problem to Northwestern utilities. But research in the works today may lead to a happy ending to the problem in coming years.

The artificial spawning area, to be at McNary, will duplicate what fish experts consider the best stream conditions for spawning salmon. Results will show whether salmon will accept or reject an artificial environment while following a reproductive instinct dictated by Nature. Salmon migrating upstream will be caught in large pools. If spawning occurs, fingerlings later will be returned to the river for migration to sea.

In another experiment, Washington State Fisheries Dept will dump 180,000 differently tattooed fish at various points above Big Cliff Dam on the Santiam River in Oregon. It will then set nets below the dam to catch the fish and find out what the spillway or turbine beating did to them. Big Cliff Dam approximates McNary in height.

Can Fish Be Fooled?

Portland General Electric is to experiment soon at Big Sandy Dam to determine proper size of fish screen openings, and whether sound can be used to attract fish to traps and skimmers. The idea here is to see if a recorded roar of turbulent water (played somehow underwater for the fish to hear) could fool a fish into thinking he was headed into a mighty current.

Some research has paid off already in information. When Grand Coulee (335 ft) and Shasta (487 ft) dams were built, no attempt even was made to lift fish. Instead, the fish were relocated in other streams. This operation eventually was a success, but U. S. Fish & Wildlife says severe losses were incurred so that fish populations had to be supplemented from hatcheries. Thus, when a major run is blocked, Fish & Wildlife does not consider relocation a sound solution.

Federal Power Commission staff views the future optimistically. It points out that people thought fish ladders wouldn't work until strategic dams proved they did. Now, FPC suggests, somehow a solution will be found to passing fish downstream safely if high dams are built.

But probably every utility man who must cope with the fish problem finds himself akin at least in spirit to Idaho Power's Administrative Assistant Gib Stanton. Stanton turns pale whenever he thinks of fish. He just wishes they all could fly.

At 1957 Street & Highway Lighting Conference,

• Power companies told to plan now for Federal Highway program. Be ready with service and design help. Manpower crucial

• Equipment and practice trends are traced. See more multiple circuits with photo-cell control, higher voltages, filaments vaporize

The rapidly changing picture in street lighting and the effect on it of the Federal Highway program were outlined for utility lighting men at General Electric Co's recent 1957 Street and Highway Lighting Conference in Ashville and Hendersonville, N. C.

Uncle Sam's Federal Highway program, now a-building, was the big topic of speeches and coffee-break conversations. Joseph Barnett, Deputy Assistant Commissioner of the Commerce Department's Bureau of Public Roads, told the power-company men, ". . . For several years it (the Highway Program) will mean the expenditure of $2.5 billion annually, superimposed on a record-breaking program for other Federal-aid routes representing an annual expenditure of over $1.5 billion. . ." GE's E. G. Wendling, talking on its market possibilities, made these points:

• Utilities have traditionally offered a complete street lighting package to their highway customers, consisting of equipment installation, maintenance and energy. Under the Highway Act, utilities should now be able to offer the maintenance and energy portions. Reluctance to do this will only cause unnecessary delay.

• Scope of the program means utilities will have to provide lighting maintenance at greatly expanded rate. Plan now for equipment and manpower.

• Highway lighting will stimulate greater industrial, commercial and residential loads. Anticipate now the needed generating and T&D equipment.

• Trained manpower will be a crucial item. (Barnett made this same point.) Power companies are going to be asked for application and design assistance; they'd better revise lighting departments to give it.

• Overriding consideration will be to work closely with state and municipal lighting people. Utilities must be remembered as friends, not foes, of highway program.

Where Is Street Lighting Headed?

Where is street and highway lighting going, equipment-wise? According to K. D. Tobin of GE's Outdoor Lighting Department, the trends are:

• Large filament lamps are giving way to more efficient vapor sources, but smaller series filament lamps are still very good for residential and light-traffic streets.

• New control systems for series vapor circuits are constantly being perfected.

• Multiple circuits are on the upswing. Photo-cells are the coming method of control.

• Increased distribution voltages in service areas along highways (shopping centers, parking lots, etc.) will make higher voltages in street lighting practicable.

DEMONSTRATION STREETS are used by GE to show many combinations of street lighting now in use in the U. S.

TEST APPARATUS is lined up by lighting engineer to check motorist's comfort factor under night driving conditions

GE revealed its new demonstration streets (see illustrations) at Hendersonville. Streets are only ⅓ mile long, but they are said to offer every combination of roadway lighting effects on the American road today. According to J. T. Bailey, general manager of the Outdoor Lighting Department, it would be necessary to visit many towns to see everything that can be seen on them. "As far as we know, it is the only facility of its type anywhere in the world," he said.

Conferees were given a tour of the new GE plant and an exhibition of the demonstration streets.

The last day of the three-day confab was given over to power company men, who told of their interesting and successful lighting installations.

General manager Bailey wound up things with a call to the utilities to meet their obligations in opportunities and challenges in America's outdoor lighting program.

25,000 FT of this cable were installed on the Consumers Power system in an effort to solve problem of tree conflicts with primary feeders in urban areas

Spacer-Type

In Consumers Power test new 15-kv cable simplifies construction and operation, has favorable initial cost

G. W. GRUENEBERG, General Engineering Department, Consumers Power Co, Jackson, Mich.

Consumers Power Co is experimenting with a new plastic, spacer-type, 15-kv cable in an effort to solve the problem of tree conflicts with primary feeders in urban areas.

This new construction offers several advantages:

- Initial cost compares favorably with tall-pole, skip-span, open-wire construction, which is commonly used on the Consumers system.
- Need for specially designed terminals and skilled cable splicers is eliminated.
- Construction and operating practices are simplified because the construction closely parallels open-wire crossarm design.

Approximately 25,000 ft of this spacer-type cable has been installed on the system. About 20,000 ft is operating at 7,200 v, and some 3,100 ft at 8,320 v grounded neutral.

Stranded aluminum conductors covered with 0.150-in. polyethylene and 0.032-in. heat-sealed vinyl tape were used originally. But a more recent installation, operating at 4,800 v, has 0.135-in. polyethylene with a 0.015-in. irradiated polyethylene covering.

All of the installations are two-conductor cable runs with a 0.313-in. high-strength, copper-covered messenger. The messenger also serves as a system neutral on grounded primary circuits.

This construction procedure was used on initial installations:

1. Pole attachments were placed, and the messenger was adjusted to proper sag.

2. Covered conductors were pulled in with a temporary cable support at each pole to maintain them in the relative position they would occupy in the plastic clamp.

3. The covered conductors were

Cable on Trial in Trees

sagged in between the temporary pole supports.

4. Plastic clamps were installed at 30-ft (±5 ft) intervals with help of a ladder truck. The approximate mid-span clamps in two adjacent spans were installed first, then the intermediate clamps, and finally the clamps at the pole.

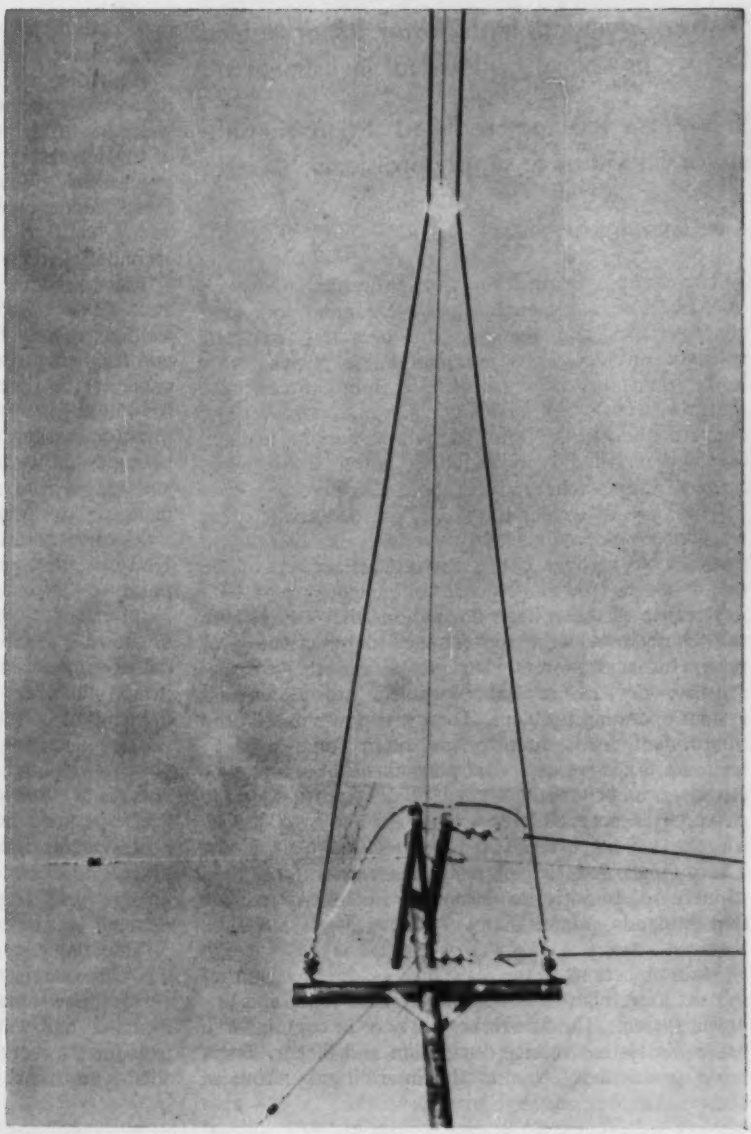
5. Same procedure was followed in the remaining spans.

After limited preliminary instructions to construction crews, the project went quite smoothly. Equalizing of sag was a problem until construction procedures were worked out.

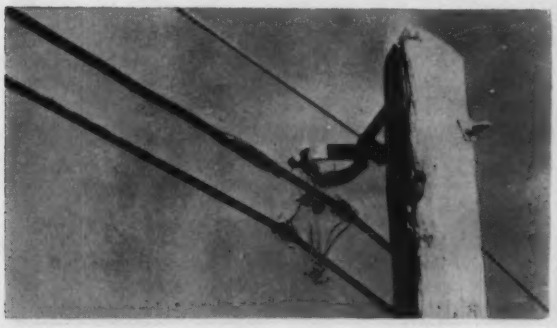
On tangent and small angle construction a clevis was used to provide conductor clearance from the pole. Phase conductor deadends were made on standard crossarms with the messenger deadend 16 in. above the crossarm. The messenger and aluminum cables were spliced with compression splices, and tap connections were made with standard parallel groove connectors. Splices and taps were covered with plastic tape.

Cutout crossarms for new transformer installations were put in parallel to the cable run. Existing transformers, however, were left intact with the cutout arm perpendicular to the cable run.

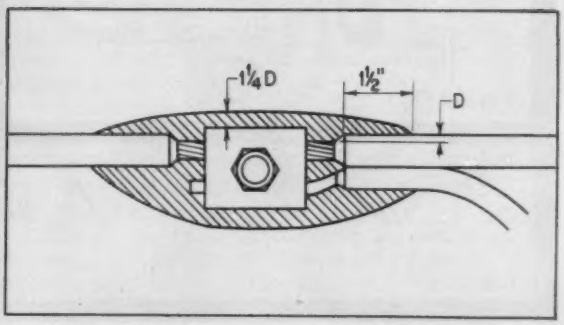
This non-shielded type cable, which does not offer complete protection to human life, is treated by linemen as a bare, energized primary conductor. Tree clearance must be maintained to protect the cable from damage. In general, maintenance trimming is not a major cost on aerial cable installations.



DEADENDS WERE MADE with messenger 16 in. above crossarm. All installations are two-conductor runs with 5/16-in. high-strength, copper-clad messenger



CLEVIS was used to provide necessary conductor clearance from the pole on tangent and small angle construction



TAPS were made with standard parallel groove connectors. All taps and splices were covered with plastic tape

Frequency Converter Welders Keep

- **Lower demand, high power factor reduce factory power cost, electrical investment**
- **3-phase loading, reduced flicker simplify motor and furnace supply problems**

F. W. JAKSHA, Sciaky Bros, Chicago, Ill.

The 3-phase frequency converter welder offers one of the best available methods of overcoming poor load characteristics and reducing the operating costs of resistance welders. Its inherently high power factor lowers the industrial plant demand and, consequently, the power costs. In turn, high power factor and low demand reduce the size of power supply needed. Average installed cost, including power transformer, feeders, and switchgear runs about $35 per kva.

This type of welder minimizes the disturbance that resistance welders inevitably produce on distribution systems. As a consequence, the utilities are one of the major boosters of this type of equipment.

Because of the voltage fluctuations they cause, with the consequent light flicker and malfunctioning of relays, furnaces, motors, instruments, and other voltage-sensitive devices, resistance welders are a constant system operating problem. Their low power factor and intermittent load characteristic often force industry to tie up excessive capital in plant distribution systems. Although associated equipment may improve the load curve, it is generally recognized that cost of service for the welder exceeds the revenue from it alone. The number and size of resistance welders continues to increase. Inquiries to the author's company indicate that demands greater than 2,700 kva 3-phase will be required soon.

Main objections to the resistance welder are its intermittent load, high demand, single-phase load, and low power factor. The first three, singly or in combination, cause the system voltage fluctuation and flicker. There is no practical solution to the intermittent nature of the load. The 3-phase frequency-converter welder can, however, help minimize the other three problems.

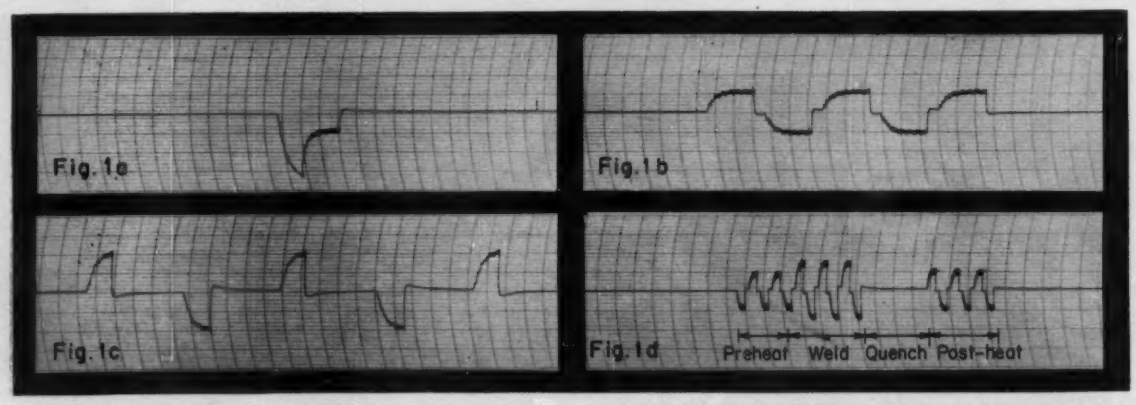
High demand often can be reduced by redesigning the welder's secondary circuit. The load of a resistance welder is principally in the resistance and impedance of the secondary. Normally, welder impedance is five to ten times greater than that of the parts being welded. Power factor of a typical single-phase welder may run as low as 20 to 40%. Consequently, any reduction in secondary circuit reactance reduces demand.

Four methods may be used to overcome the resistance welder's undesirable characteristics: stored energy welders, motor-generator sets, power factor correction, and frequency converters. Stored-energy welders, using capacitor or reactor storage methods, have been used for longer than 15 years. They have low demand, 3-phase operation, and high power factor, but are limited to materials with short weld times, such as aluminum and magnesium alloys or light-gauge steel. Welding ferrous alloys often takes several seconds.

Motor-generator sets eliminate single-phase loading. However, the combination of a M-g set and a single-phase welder is seldom used because of space and cost requirements. Similar considerations restrict the use of the M-g set for correcting power factor.

Capacitors in series with the welder supply primary correct power factor and minimize the demand of a single-phase welder. But it is an expensive method, usually requiring special, high-voltage welding controls and transformers. Costs often run about 50% of that of the welder alone. In addition, operation is more critical. To maintain near-unity power factor, and proper machine operation, capacitance must be adjusted for changes in secondary voltage and impedance. This method of reducing demand is, at best, a compromise.

The frequency-converter welder provides a substantial decrease in demand without using capacitors to correct power factor. Basically, it consists of two 3-phase, half-wave ignition rectifiers, electronic controls for the rectifiers, and a specially designed 3-phase, shell-type transformer. The controls determine the



CURRENT PATTERN varies with metal and type of weld. Fig. 1a is single-pulse aluminum alloy current; 1b shows longer pulse for steel. Seam-welding (1c) has longer intervals between pulses. 1d is typical alloy steel pattern

Industrial Cost Low

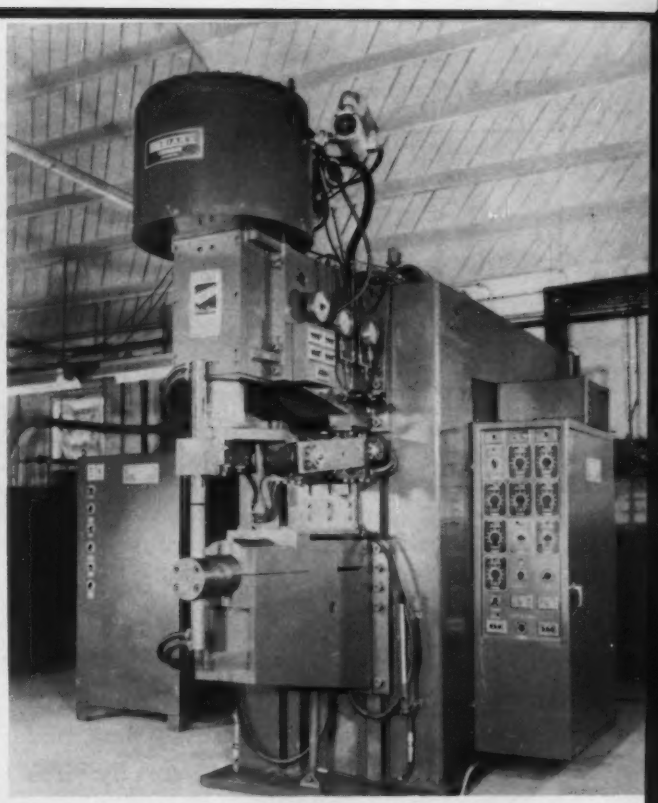
instant of ignition and cut-off of each rectifier, as well as duration of conduction. Transformer secondary and all three primary windings are on a common core.

Each cycle of converter power consists of a positive and negative pulse, each supplied from one of the half-wave rectifiers. Pulse duration is controlled from a minimum of 1-1/6 cycles to a maximum of 20-1/6 cycles, based on 60-cps operation. These pulse times compare to a frequency range of about 25.6 to 1.5 cps.

Lower frequencies require larger transformer iron cores. Most frequency-converter machines are designed for a low frequency of about 6 cps. Because load on a resistance welder is determined primarily by the highly reactive secondary circuit, reduction in frequency reduces reactance, and therefore demand.

In many applications, the frequency-converter welder is selected for better weld and production results, with reduced kva demand a secondary consideration. In most larger machines, however, power demand and weld results assume equal importance. The solution is often a frequency-converter welder.

With the proper controls on a frequency-converter welder, welding current patterns, as indicated in Fig. 1, may be obtained. Fig. 1a shows a typical pattern of current used in welding aluminum. Aluminum alloys usually are welded with a single impulse, which rises exponentially, then is allowed to decay exponentially.



THREE-PHASE welder drew 314,000 amp at 444 v, has 2,720-kva demand. Single-phase demand was 19,000 kva

Case Histories Cite Benefits

Advantages of such a current pulse are reduced electrode pickup, because of slow current rise, and a ductile, homogenous weld structure formed during the decay period. At the start of current decay, electrode pressure is increased about 150%. The forging action produced results in a better weld structure.

Fig. 1b shows a typical welding current pattern for steel; here welding time is much longer than for aluminum. Fig. 1c shows the increased time between current pulses used in seam-welding steel. A possible pattern for an alloy steel is shown in Fig. 1d. This oscillogram was taken at slow speed.

Four case histories illustrate the advantages of the frequency-converter welder. In the first, the user wished to join two thicknesses of 0.102-in. aluminum alloy to military specifications. An effective welding current of 60,000 amp was required. Dimensions of the welder secondary were 10 x 36 in. To obtain 60,000 amp on a single-phase machine required a demand of about 1,350 kva at 30% power factor.

The 3-phase frequency converter demand was 500 kva. Calculated voltage drop at the customer's power transformer was 1.8%. The customer was served by a 3,600-ft, 4/0 cable with 14.5-in. spacing. Substation feeding the distribution line was rated 4.16 kv, 3,750 kva at 5.41% impedance. Voltage fluctuation with a single-phase welder would have been about 5%.

The second case compares two welders doing identical jobs with identical performance in the same plant. They were used to seam-weld heavy-gauge mild steel. Throat dimensions were about the same. Effective welding current was 35,000 amp; the primary supply, 440 v, 60 cps. The single-phase machine had a 550-kva demand and a transformer ratio of 28. Demand of the 3-phase machine was 295 kva, its transformer ratio 90. The single-phase machine line current was 220% greater than that of the 3-phase welder.

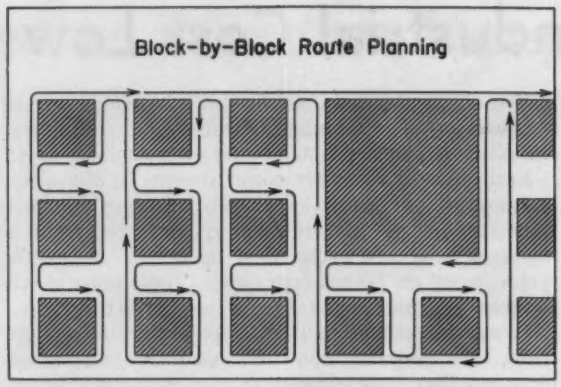
Transformer ratios are a simple and effective way of comparing electrical efficiency of welders. Of two machines doing the similar jobs, the one with the higher turn-ratio is more efficient and has the lower primary current.

The third case required a seam welder with an unusually long, 85-in. throat and a 6-in. vertical gap. Two pieces of 0.064-in. aluminum alloy were to be welded according to military specifications. Permissible weld time was 0.05 sec. Apparent machine impedance while welding was 515 micro-ohms at 60 cps. With a 3-phase welder, it was 100 micro-ohms. Peak welding current for each machine was 87,000 amp. But the single-phase machine had an rms line current of 4,060 amp and a transformer ratio of 15, compared to a line current of 810 amp and a transformer ratio of 76 for the 3-phase machine.

The fourth case, spot welding two pieces of 0.25-in. aluminum alloy, required a weld current of 280,000-amp peak. The machine was designed for 300,000 amp at 440 v with a transformer ratio of 63. Test data indicated a value of 314,000 amp at 444 v with a 2,720-kva demand. Short-circuit impedance of the machine, viewed from the secondary side, was 31.7 micro-ohms. For a 300,000-amp peak secondary current, a single-phase machine would have required a ratio of about 5 and a demand of about 19,000 kva vs the 2,720-kva demand of the 3-phase machine.

Time Factors for Meter Readers	
1 Block walking (10 per mile)	1.50 min
1 Whr meter, upstairs or basement	2.67 min
1 Whr meter, inside but accessible	1.67 min
1 Whr meter, outside	0.66 min
1 Whr meter in multiple	0.33 min
1 Indicating demand meter (read, reset, seal)	0.75 min
1 Mile driving (15 mph)	4.00 min

These specific time factors, plus . . .



this exact reading sequence, show . . .

How to Cut Meter Reading Cost

Mississippi P&L's mathematical method of determining meter routes saves time and money, and reduces reading errors by 80%

W. R. JOHNSON, Chief Clerk, Central Division, Mississippi Power & Light Co, Jackson, Miss.

A mathematical method of determining meter routes, combined with an exact sequence of reading meters, has equalized work loads, improved employee relations, and cut costs at Mississippi Power & Light Co.

The new method is based on precise time factors for walking or riding between meters, and reading and resetting different types of meters in various locations. Time allowances are also made for rough terrain, obstacles, anticipated residential growth, and travel to and from the route.

Before routes can be assigned efficiently, the exact sequence of meters in the route book must be fixed—a very expensive and difficult part of formalizing meter reading. Results show, however, that a general plan for an entire area provides phenomenal time saving over routes that just happen.

A general scheme was devised for Jackson, Miss., using maps and field trips to determine the areas to be covered by walking and riding. Then the city was divided into meter reading divisions, each bounded on two sides by thoroughfares or barriers.

As a reader proceeds through one division and back through another, he covers each street running between boundaries in succession. First one side of the street is traveled and then the other, along with side streets. In this way readings are always taken on the right and in the general forward direction. These rules assist new readers in finding the next meter and in avoiding left turns when driving.

After establishing this sequence, the next step was to determine how much ground a reader could cover in a day. Field tests were made with stopwatches, pedometers, and speedometers, and detailed time and volume logs were kept on all readers by routes. These studies produced time factors for each function performed by a reader (see table).

However, time factors were avoided for mixed functions. For example, a single outside watthour meter is one time factor. But a watthour meter including a demand feature to be read, reset, and resealed is two factors—multiple and demand.

There is no time factor for walking from the street to a meter. Instead, the factor on the largest class of meters, outside meters, was liberalized to compensate for service footage. This adjustment was possible because the ratio of service footage to front street footage is relatively consistent throughout the area.

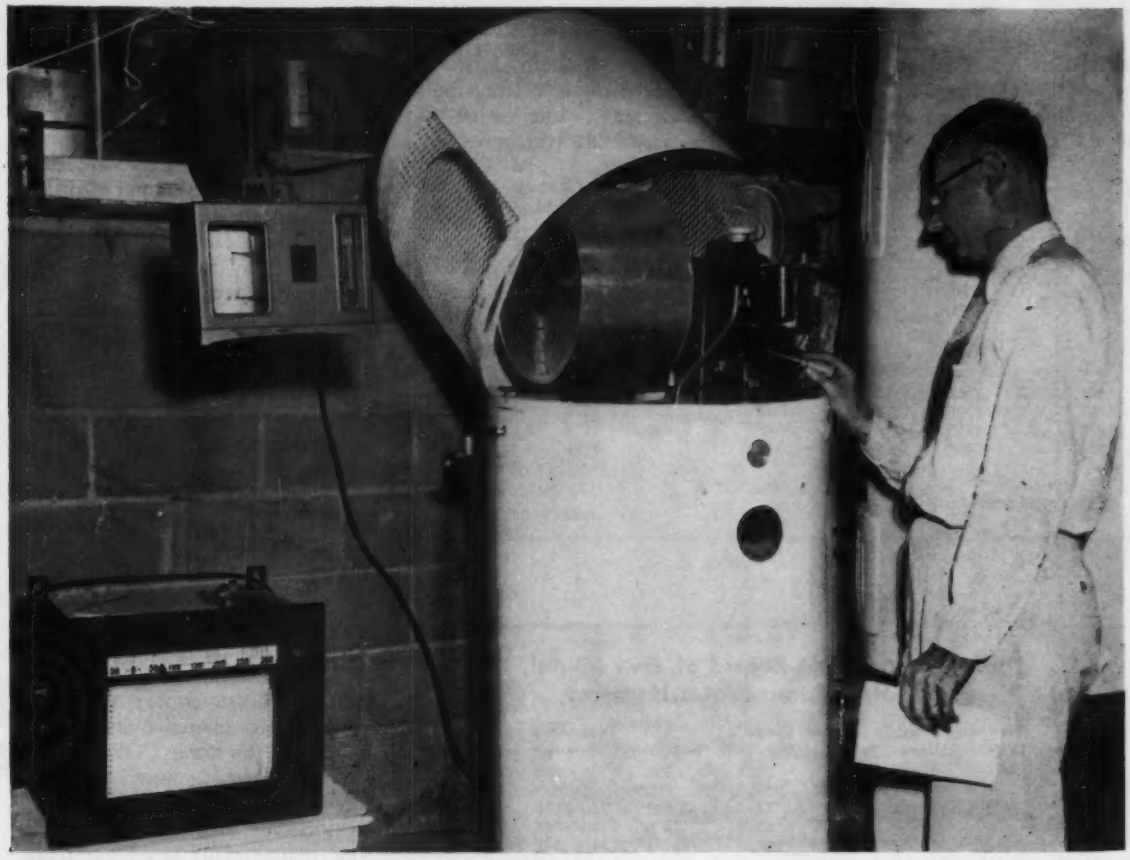
Length of a route is determined by multiplying the time factors by the number of blocks and meter types to give a total of 480 min—a normal work day. The route is then adjusted for such time allowances as obstructions, anticipated growth, and travel to and from.

Unusual Growth Is Greatest Hazard

The greatest hazard in any meter-reading scheme is unusual growth of customers adjacent to the city or in sparsely settled areas. This overload is relieved by combining it with the overload of an adjacent area, which usually grows proportionately, to create a new route. This new route is weaved into the existing ones so that the general scheme of reading is never violated.

Until a new route can be developed, however, meter readers cooperate in carrying growing areas. To avoid work inequities, they are assigned different routes monthly. Also, the readers, informed about the mathematical method of determining routes, know that overloads will be relieved as soon as practicable. This often inspires a reader to question growth, test it, and actually perform part of the policing responsibility of the head reader.

This more efficient meter-reading system has saved time and money. Moreover, elevating the reader to a challenging position with a uniform, an objective, and a sense of pride has reduced reading errors about 80%. Employee turnover is almost negligible; gripes have been turned to constructive comments. Customer relations have been improved greatly also.



Reduced Energy use in Kansas P&L area tests suggests . . .

Heat-Pump Water Heater Has Edge

EARL A. PALMBERG, Power Sales Specialist, Kansas Power & Light Co, Topeka, Kan.

CHESTER P. DAVIS, JR, Research Agricultural Engineer, Farm Electrification Section, US Department of Agriculture

Developmental air-to-water heat-pump water heaters satisfactorily provide hot water with 40 to 50% of the energy required by conventional means. An aggregate of 13 years of operating experience with three types of heat pumps has established coefficients of performance from 1.38 to 1.98. The COP is critically affected by outlet water temperature. Load factors ranged from an estimated 19.6 to 31.6% for five models of one type. Only two minor disadvantages were reported by users.

Based on operating experience with these test types, Kansas Power & Light Co believes further development will provide a heat-pump water heater with a higher COP. Until then, the heat-pump water heater will be most attractive where maximum advantage can be taken of the reduced energy requirements.

Company Builds First Unit

Testing of heat-pump water heaters began with Kansas P&L when the company built and installed a 300-gal, 3-hp unit at the Kansas State 4-H Club Camp. The heater provides water for shower and bath facilities. It heats 12.05 gal per kwhr to an average temperature of 138F. This gives a COP of 1.98 for an average water usage of 200 to 250 gal per day. During the summer-months' operation of the camp, the cooling and dehumidification of air in the building housing the heater are welcome benefits.

During 1950-53, developmental heat-pump water heaters made by one manufacturer were installed in residences served by Kansas P&L. The company purchased a 58-gal, ½-hp unit of this type for installation in the home of Ralph Lipper.* In this type of heater, condenser coils were within the tank in direct contact with the water. Average usage for this family of four was 50 gal per day during the one-year test. COP of the heat pump was 1.78. Energy required was 4.2 kwhr per

* Professor and research director, Kansas Committee on Relation of Electricity to Agriculture, cooperating with the Agricultural Engineering Department, Kansas State College, and the US Department of Agriculture.

day. Maximum demand was 0.73 kw and load factor 34.3%.

For low rates of daily water usage, COP dropped appreciably as shown in Fig 1. Standby losses are believed to be the chief contributor to this decrease. Idle or no-load tests indicated an average of 0.65 kwhr per day was required to maintain water temperature. This water heater was moved to the home of Family A to extend the operational tests. Results of these tests are listed in Table I. Conditions of usage closely paralleled those of previous observations. However, the gallons of hot water produced per kwhr recently dropped sharply because of mechanical deterioration of compressor valves.

In June, 1955, Kansas P&L bought six 50-gal, ¾-hp, 115-v development water heaters of a different design and installed five in selected homes. The sixth replaced the water heater of Family A and was used for more detailed testing.

Test information during one year for this family again showed an average usage of 50 gal per day and an average COP of 1.5. This type of heater has the condenser coiled around the tank exterior, rather than in direct contact with the water. This difference largely accounts for the lower COP. An external condenser, however, offers simplified construction, accessibility for servicing, and compliance with code requirements in certain areas.

Table I—Operating Data for 58-gal, ½-hp Heat-Pump Water Heater

Year	Water Temp	Water Usage Total Gal	Water Usage Avg Gpd	Total Kwhr	Gallons per Kwhr	Coeff. of Performance
1953.....	135F	18,720	51	1,830	11.5	1.78
1954.....	130F	15,293	42	1,296	11.8	1.67*
1955.....	135F	17,145	47	1,540	11.1	1.71*
1956**.....	135F	9,210	40	1,027	8.96	1.38*

* Estimated
** First eight months only

Table II—Operating Record of Five 50-gal, ¾-hp Heat-Pump Water Heaters

Location	Hours in Test	Kwhr Used	Water Usage Total Gal	Water Usage Gal/24 hr	Gal/kwhr	Thermostat Setting	Estimated Load Factor
A	9,498	2,731	23,970	60.8	8.8	140–150F	22.2%
B	9,625.4	3,225	27,456	68.5	8.5	140F	25.6%
C	9,482.4	3,333	29,790	75.5	8.9	150–165F	27.0%
D	9,600	3,956	26,230	65.5	6.6	155–170F	31.6%
E	4,224	1,074	12,255	69.2	11.4	140–150F	19.6%

Family size and water-using appliances for each location—A. Two; non-auto wshr, dshwshr, two bths. B. Three; auto wshr, one bth. C. Five; auto wshr, dshwshr, two bths. D. Five; auto wshr, dshwshr, two bths. E. Four; auto wshr, three bths.
Heat-pump heaters used 13–14 months at locations A-D; used only six months at location E and removed because not enough hot water was being furnished.
Study directed by H. S. Hinrichs, Asst Sec-Treas, Kansas P&L.

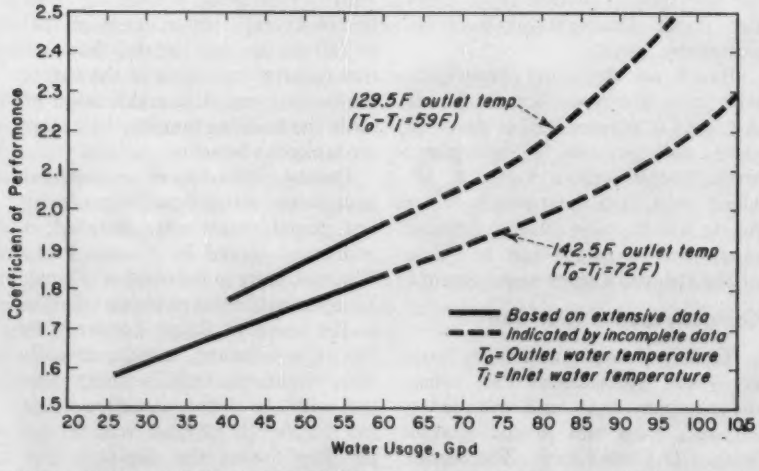


FIG 1—WATER HEATER PERFORMANCE is related to the rate of daily water usage. At low rates of usage, standby losses cause a drop in performance

Cuts Load Factor

Maximum demand was 1.3 kw, daily average energy use 5.9 kwhr, and average annual load factor 24%. This lower load factor was due primarily to a larger condensing unit used with a smaller water-storage capacity. During idle or no-load test, an average of 1.5 kwhr per day was required to maintain the water temperature.

This sixth unit was used also for a 120-gal drawdown test, as recommended by the joint AEIC-EEI Heat Pump Committee. In this rigorous test, a complete change of water is made in the first 2¼ hr, and two-thirds of the total daily usage is made after only 3½ hr of operation. Test data are shown in Fig 2. Note that the outlet water temperature dropped to 107F, lower than desirable.

One year of operating data for the other five water heaters are summarized in Table II. Gallons of hot water per kwhr vary within this period due to different thermostat settings, total usage of hot water, and inlet water temperatures which

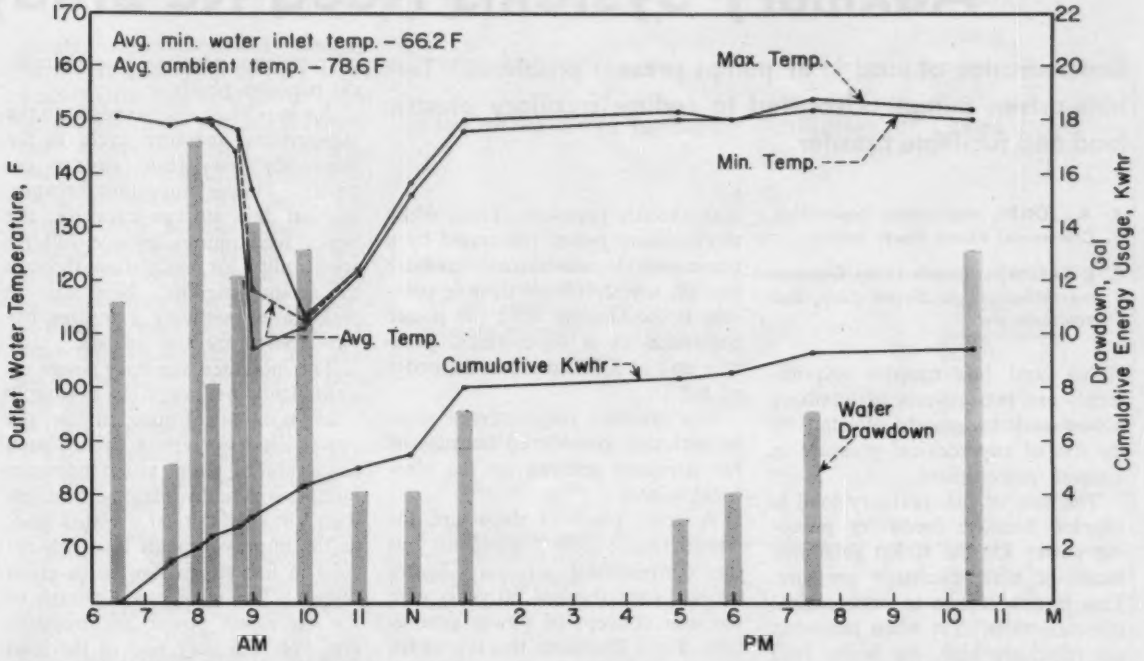


FIG 2—120-GAL DRAWDOWN TEST of a 50-gal, ¾-hp, 115-v heat-pump water heater discloses that minimum outlet water temperature is 107 F, which is lower than desirable. Two-thirds of total usage occurs in first 3½ hr of use

changed with the seasons.

Outlet water temperature has a critical influence on the efficiency of operation and COP of the heat-pump water heater. Variation in COP for the heat-pump unit and a conventional resistance water heater are compared in Fig 3. Although the heat loss through the tank averaged about 8,100 Btu per day at 140F storage temperature for both types, the loss in COP was far greater for the heat-pump unit. The result was a COP comparable to that of the resistance water heater. Indications are that additional losses are due to the increased temperature at which the refrigerant condensing equipment is forced to operate.

Service requirements for heat-pump heaters have not been broadly established. There is indication of greater condensing unit stress and wear due to higher operating head pressures (200 to 275 psia) than would occur with conventional refrigeration and air-conditioning equipment. But development of equipment capable of meeting similar service conditions in automotive air-conditioning units suggests that the problem can be solved.

Service problems generally are conventional and can be handled by local refrigeration service concerns. Condensers within the tank, however, are subject to mineral deposit and corrosion and are inaccessible for repair. Two minor disadvantages were reported by users. Operating noise level was sometimes disturbing, and the water was too cold following particularly heavy withdrawal. But these were not considered serious limitations.

Air-cooling Capacity Used

No attempt has been made to analyze quantitatively the air-cooling capacity of the units. The manufacturer reported his tests showed this capacity to be about 7,400 Btu per hr. This cooling capacity can be utilized in a utility or other room in the house. A temperature-controlled water valve may be installed to waste hot water to drain for continued cooling after hot water demands have been met. Dehumidification accompanying cooling was particularly appreciated by the users. Basement installations prevented mustiness and condensation on cool surfaces. Dehumidified air aided winter indoor clothes drying.

Present major obstacle to mass production of heat-pump heaters is the relatively higher initial cost. In addition, special rates for resistance water heating will offset some of the energy saving that might result from use of the heat-pump water heater on the residential rate.

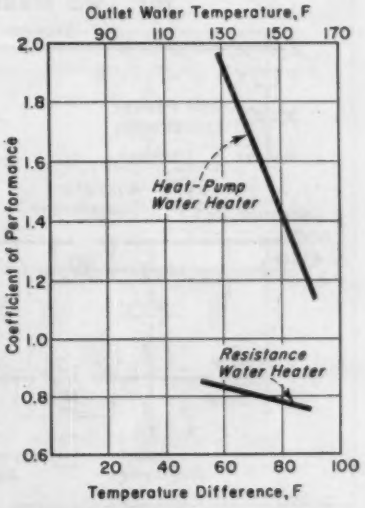


FIG 3—PERFORMANCE VARIES with temperature of the outlet water

Auxiliary Systems Need Re-Study

Concentration of load in BF pumps present problems. Turbine-driven pumps advocated to reduce auxiliary electric load and facilitate transfer

A. R. **JONES**, Application Engineering, Commercial Atomic Power Activity

C. J. **BALDWIN**, Electric Utility Engineering, Westinghouse Electric Corp, East Pittsburgh, Pa.

Size and bus transfer requirements are two aspects of auxiliary power systems greatly affected by the use of supercritical pressure in a steam power plant.

The size of the auxiliary load is affected because feedwater pumping power for the steam generator increases with discharge pressure. This is not unique to supercritical pressure units. Yet when pressures are relatively high, the boiler feed pump power requirements become the major part of the auxiliary load.

Power requirements of all other auxiliaries, amounting to between 3 and 3.5%, are essentially constant with throttle pressure. Thus, while the auxiliary power consumed by a conventional subcritical pressure unit of, say, 2,400-psi throttle pressure is the familiar 6%, the power consumed by a supercritical pressure unit at 5,000 psi is in the order of 8.5%.

Bus transfer requirements must be seriously considered because of the stringent demand on the electrical system.

A good point of departure for considering these problems is the conventional auxiliary layout evolved over the last 20 years with the unit concept of power generation. Fig 1 illustrates this layout for two medium-sized units. Although this system is common, it certainly is not the only system layout in use today nor is it likely to be the best design for every case. However, as an illustration of principle Fig 1 describes the conventional auxiliary system commonly in current use. It forms a good basis for a discussion of problems peculiar to supercritical pressure plants.

An important characteristic of the supercritical pressure cycle is the inherently low steam storage capacity. This is important because, without this storage capacity, the boiler feed pumps assume full responsibility for circulation through the steam generator. New start-up procedures involving a turbine bypass system are also needed.

The increased auxiliary power requirements mentioned do not imply a less economical unit. In fact, the power used by certain drives, such as circulating water and condensate pumps, is actually a few percent less than for a subcritical pressure unit, as the improved plant heat rate results in less steam flow for a given output. The significant features of the increased power requirements are, first, the very size of the load to be served by the auxiliary system of a large unit, and second, the concentration of load in the boiler feed pump drives. This concentration presents problems of motor starting and bus transfer.

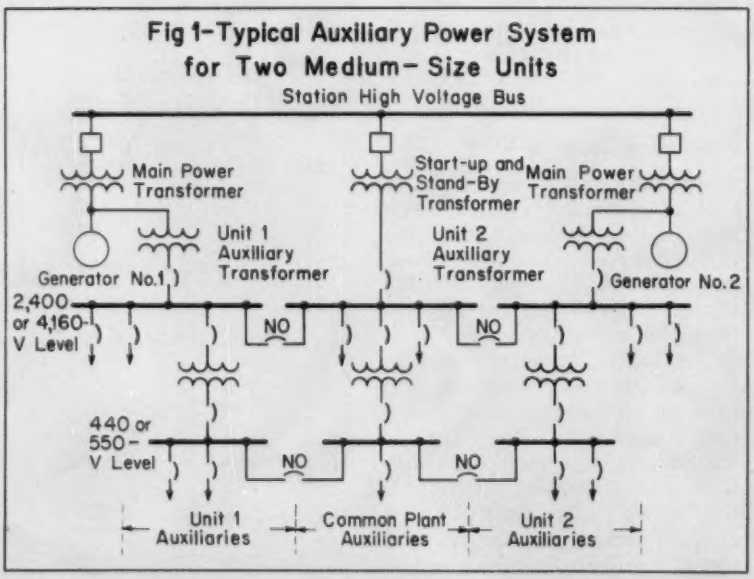
Transfer Depends on Fuel Used

The need for transfer of any given drive after an emergency tripout must be considered with regard to the safety of the steam generator and to providing for an immediate hot re-start. Because of the former, practice will depend on whether the unit is coal, oil, or gas-fired.

To provide for a hot re-start, firing should be retained at a reduced rate. But some believe firing cannot be safely reduced in part (say three out of four mills stopped) in a coal-fired unit because the air distribution is wrong following tripout from near full load. If this is so, all mills must be stopped, that is, no mills transferred, on a coal-fired unit. Once air distribution is corrected, one mill can be re-started to prevent chilling. Use of oil or gas permits firing to be reduced safely to a rate corresponding to the 30% steam flow through the turbine bypass system required with the once-through type boiler. In this way the unit can be retained in a condition ready for an immediate hot re-start.

To prevent the need for boiler

Adapted from a paper presented by the authors at the Winter General Meeting of the American Institute of Electrical Engineers, New York, N. Y., Jan. 21-25



TYPICAL AUXILIARY system for two medium-size units is designed on a unit basis but with one alternate supply and single bus for common auxiliaries

If Supercritical Pressure Is Used

purging, the fans should be transferred. If immediate re-start is not intended, the fans need not be transferred, but then purging is essential. Condensate and circulating water pumps should be transferred for a hot re-start. The boiler feed pumps must maintain circulation through the bypass systems when an immediate hot re-start is intended.

Adaptability of the conventional auxiliary system of Fig 1 becomes more difficult as unit size and auxiliary loads grow. Consider a 5,000-psi, 600-Mw unit. Connected auxiliary load will be about 72 Mva.

The significance of this size load can be interpreted best in terms of the limitations of available 5-kv circuit breakers. At 4,160 v, a single 2,000-amp breaker can handle 14,430 kva within its continuous rating. Furthermore, if bus voltage is to drop no lower than 70% on total load transfer and the momentary duty on the 5-kv breaker is not to exceed 60,000 amp, the total connected kva on a 4,160-v bus to be transferred must not exceed 11,850 kva. Partial transfer is less demanding. These figures emphasize the limitations of the system of Fig 1.

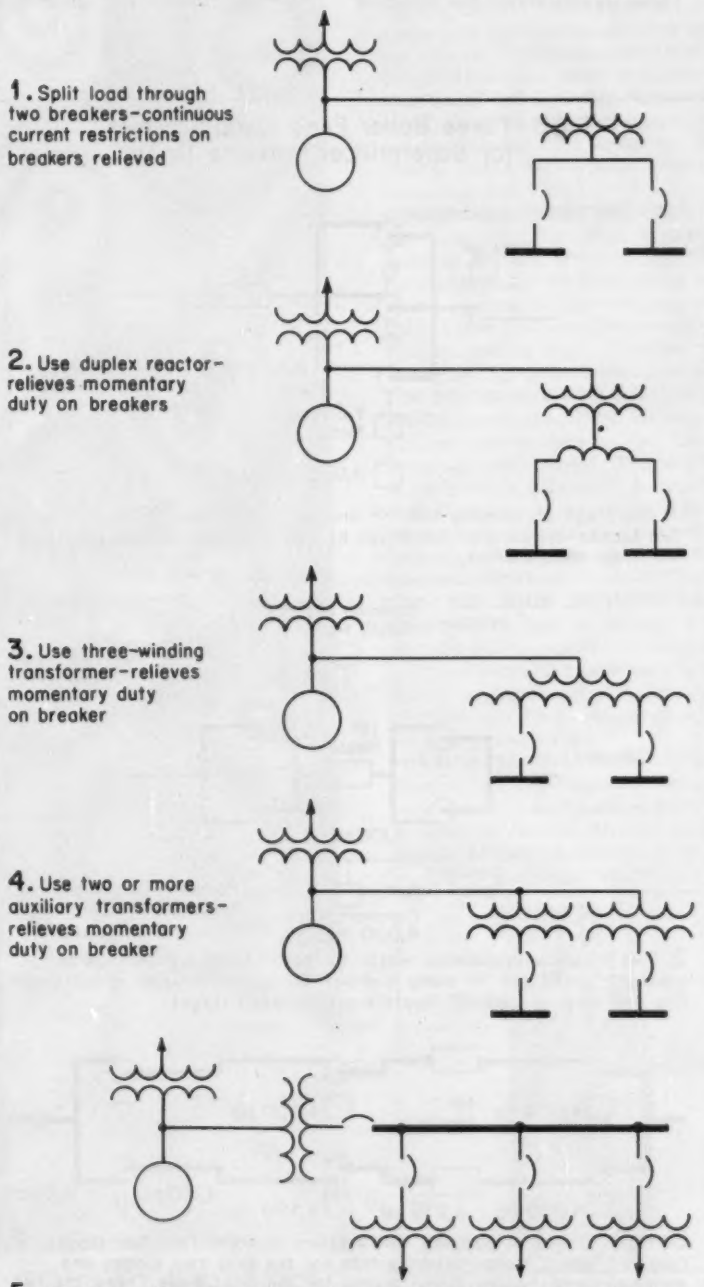
Modifications Necessary

Modifications of this system have been used for some larger subcritical pressure units. Some of these are shown in Fig 2. Continuous-current restrictions can be raised by the use of more than one breaker per transformer secondary. This permits transfer of as little as half the load at a time, it does not relieve the breaker momentary requirements.

Momentary-duty relief can be accomplished by the use of a duplex reactor to split the circuits from a single auxiliary transformer, the use of a special three-winding auxiliary transformer or reactances proportioned to give low-voltage drop on starting and transfer but high impedance to momentary fault current, or the use of two separate auxiliary transformers accomplish the same purpose.

For large cross-compound units the two-transformer scheme is often used, one transformer being on the terminals of each generator. A fifth modification is one in which

Fig 2–Five Ways to Supply Auxiliaries of Large Units


1. Split load through two breakers–continuous current restrictions on breakers relieved
2. Use duplex reactor–relieves momentary duty on breakers
3. Use three-winding transformer–relieves momentary duty on breaker
4. Use two or more auxiliary transformers–relieves momentary duty on breaker
5. Use high voltage feeders run to unit substations–breaks up load and alleviates breaker interrupter duty

13.2-kv feeders are run to unit substations near the loads. Breaking the loads into smaller units alleviates the breaker interrupting requirements, and there is some saving in the lower required cable capacity at the higher voltage. Space evaluation, however, is important and must be taken into account.

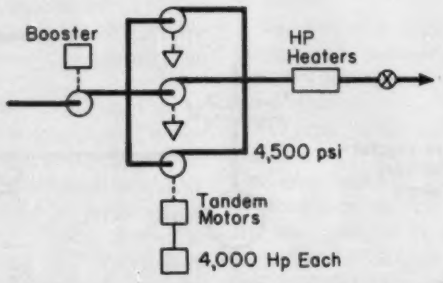
These modifications are sufficient for present-day unit sizes but will be taxed by loads such as those anticipated. One solution is further extension of present design, such as the use of three instead of two transformers or use of a higher voltage level. Such extensions are costly and make another solution, the use of some turbine drives, attractive.

Turbine drives for supercritical pressure units already are attractive for other reasons. Boiler feed pump designs for pressures above the critical dictate operation at high speeds, in the neighborhood of 5,000 to 8,000 rpm. This means use of a geared motor or turbine.

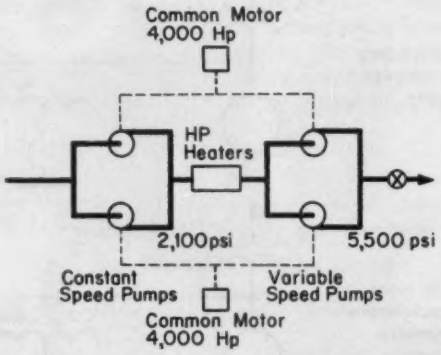
Furthermore, the higher power consumption of the boiler feed pumps can be compensated for by good control of circulation. This requires a wound-rotor motor, a hydraulic coupling, or a turbine drive. With the increased auxiliary loads and difficulty of their supply, the use of turbine drives for fans also becomes attractive as fans also require good control of speed for best economy.

Boiler feed pump and high-pressure feed water heater schemes for supecritical pressure plants planned to date are different. This is not surprising as the best layout is determined by an economic study of each particular cycle and philosophies of emergency bus transfer held by the system designer. Some schemes are shown in Fig. 3.

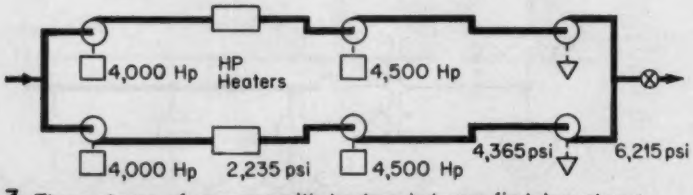
Fig 3–Three Boiler Feed Pump Schemes for Supercritical Pressure Units



1. One stage of pumping with HP heaters using three ½-capacity pumps. Two turbine-driven and one driven by two motors in tandem, each supplied from separate bus.



2. Two stages with common motor for both stages. LP pump is at constant-speed, and HP pump is driven through a variable speed coupling and step-up gear. HP heaters are between stages.



3. Three stages of pumping with heaters between first two stages. Constant-speed, motor-driven pumps for the first two stages and variable-speed, turbine-driven pumps for the final stage. There are two strings of HP heaters.

Legend: □=Motor; ▭=HP Heater; ○=Pump; ▽=Turbine

Two Views on Bus Transfer

With regard to bus transfer requirements, one school of thought holds that all auxiliaries needed for a hot re-start should be transferred to provide for the chance that a hot re-start will be possible. Adoption of this view requires that boiler feed pumps be transferred; it therefore limits the size of the transferred load on any bus. Another limitation of single motor size can be the voltage drop on starting. This cannot be made so low that the breaker momentary duties are exceeded upon occurrence of a fault.

The second school of thought holds that most of the time an immediate hot re-start will not be possible and, for equipment safety considerations, an emergency tripout should be investigated thoroughly and re-start be accomplished from complete shutdown. This philosophy is substantiated, in part, by experience which shows that only about 10% of the emergency tripouts permit an immediate reloading. Mechanical failures usually cause emergency tripouts.

Adoption of this philosophy does not involve transfer of any auxiliary drives of significant size. But voltage drop on starting can persist as a problem with large single loads.

New Portable Instrument by General Electric Gives High Accuracy Readings You Can Trust

PACIFIC GAS AND ELECTRIC COMPANY lineman uses the AP-12 to check voltage on secondary side of regulators. Highly accurate, rugged AP-12 is ideal for use in the field.

*Reg. trade-mark of General Electric Co.

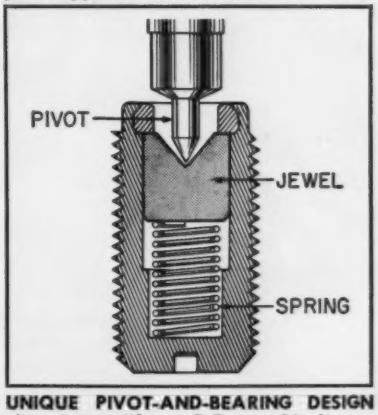
More and more power companies are finding that General Electric portable instruments give highly accurate readings you can rely on. This is especially true with the AP-12, newest addition to the complete line of G-E portables. High accuracy (¼ of 1% at full scale) and rugged, shock-resistant construction make the AP-12 ideally suited for a wide variety of measuring jobs.

COMBINING EXTREME VERSATILITY with high reliability, the AP-12 is equally at home in the lab, shop, or field, Power companies find it the ideal testing instrument, because its high accuracy—even under adverse field conditions—gives you readings you can trust . . . enables you to realize savings in both time and money.

FOR PRECISE A/C AND D/C MEASUREMENTS, choose the AP-12. Its long, more uniform scale is easier to read. Universal terminals and rugged Textolite* case make it more convenient to use in the field. New spring-mounted jewel bearings offer greater protection . . . prevent pivot blunting. And, it's shielded against magnetic effects.

FOR ALL YOUR MEASUREMENT REQUIREMENTS, look to General Electric. We offer you a complete line of portables . . . instruments for measuring a/c, d/c, or both . . . with full-scale accuracies from ¾ of 1% to ¼ of 1% . . . whatever is needed for your particular job.

FOR MORE INFORMATION about General Electric portable instruments, contact your nearby G-E Apparatus Sales Office, or write to General Electric Company, Section 582-26, Schenectady 5, N. Y. for your copy of Bulletin GEC-1384.



UNIQUE PIVOT-AND-BEARING DESIGN gives longer life to G-E portable instruments. Spring-mounted jewels cushion pressure on pivot points . . . protect against shock and damaged jewel assemblies . . . substantially reduce what is a major maintenance problem in most portables.

GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

New service-continuity watchdog

New breaker, new operating-handle sequence, and valve-type arresters assure maximum service continuity with General Electric self-protected distribution transformers

With the use of self-protected transformers steadily increasing, General Electric has developed a new breaker and a new reset handle to help utilities maintain the best possible service, especially in overload areas. The breaker provides simultaneous opening of all contacts, and the new reset handle virtually eliminates unintentional opening of the breaker by linemen.

Designated "T-2", the new breaker is used on all self-protected G-E transformers rated 37½ kva and above, together with G.E.'s dependable, long-life Magne-valve arresters

and internal fuses. Twenty per cent shorter than other types of breakers for similar application, the new breaker helps keep tank heights down.

Reduces chance of feedback burnouts

One driveshaft, common to all contacts, operates all breaker poles simultaneously. It is impossible, therefore, for the contacts to open on one line only. This eliminates the possibility of damage to motors due to undervoltage through a single closed contact and connected load.

Helps eliminate unintentional opening

Following the unique operating sequence, the lineman merely moves the handle *down* against the stop in the "closed" position to reset the signal light. So there is no possibility of accidentally tripping the breaker. It is also possible for the lineman to test the overload lamp without removing it—another unique feature.

Emergency device provides for 15% overloads

Uprated at the factory to carry an additional 20% of load before tripping out, the new breaker also includes an emergency overload device. In a few seconds the lineman can raise the trip temperature, permitting the transformer to carry an additional 15% of load before the breaker trips. This makes it possible to maintain service to the customer until the power company can replace the transformer with a higher-rated unit.

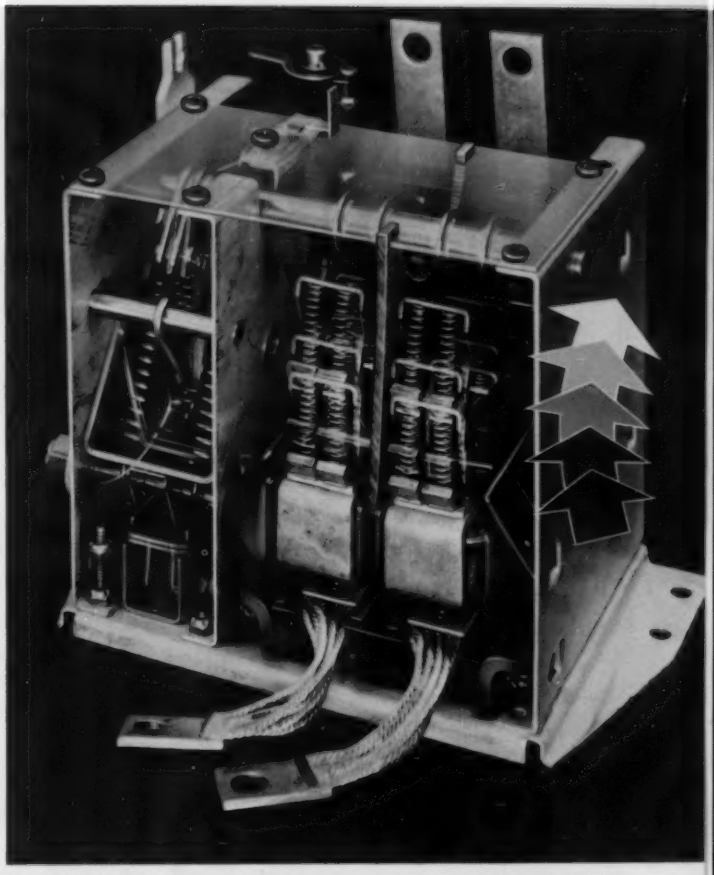
All transformers are not alike

The new circuit-breaker and new reset handle sequence are just two of the main advantages of General Electric distribution transformers. Others include *Formex* wire* to increase reliability and cut tank size, *Nitrile rubber gaskets* to give superior sealing, *Strenicor clamps* to prevent terminal breakage, and many others—evidence that all transformers are not alike.

For complete information contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to Section 431-49 General Electric Company, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

*Reg. Trademark of General Electric Co.



IT IS IMPOSSIBLE for contacts to open on one line only. For with the G-E design, one driveshaft operates all poles simultaneously.

NO ACCIDENTAL TRIPPING is possible with G.E.'s unique new operating sequence for breaker reset handle. Lineman merely moves handle *down* against stop in "closed" direction to reset light.

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GOULD PLANTÉ
The Aristocrat of
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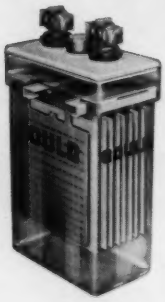

Dependable battery performance day in, day out is worth more to you than any other single benefit. Right? That's why Gould has carefully perfected the design of Gould Batteries over long test years. Manufacturing techniques at Gould are also the result of patient development, so that today you are assured of maximum power, long life, and trouble-free operation with *every* Gould battery you buy. Ask for new booklet "...so you're going to buy an industrial battery." Write Gould-National Batteries, Inc., Trenton 7, N.J.

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DISTRIBUTION—Maintenance

Device Finds Ceiling-Heat Cable Breaks

ROBERT ROSE, Indiana & Michigan Electric Co, Fort Wayne, Ind.

The portable equipment illustrated can locate accurately a break in a ceiling heating cable without marring the plaster.

In locating an open the faulty cable is first disconnected from its power source and both source and cable are connected to the tone generator. The probing device is prepared by plugging the headphones into the handle section of the probe and inserting the flexible shaft into the other end. For proper operation the clamping ring on the connector must be screwed down tight. The probe has no switch, as power is applied when the flexible shaft is attached to the handle.

Probe in hand, the troubleshooter uses the receivers to listen to the signal radiated by the cable, moving the detector or probe slowly below the ceiling. He can pinpoint the break which is then repaired from above.

The tone generator, producing a 1,000-cycle signal in the ceiling cable, contains an audio-oscillator and one stage of amplification with controls of volume and pitch suitable to the operator. The output is coupled to the faulty heating cable with a transformer that produces 180-deg out-of-phase voltages of 100 on opposite sides of the open.

The long-handled probe has a block-insulation head capped by a thin 1 x 2-in. copper plate connected to the signal amplifier through the center conductor of a microphone cable. The 23-in flexible handle makes the probe easy to move across the ceiling without use of a ladder, or over attic floors near the angle with the roof.

TEST EQUIPMENT consists of tone generator, signal detector with battery-operated transistor in handle and headphones. Box can hold all this equipment

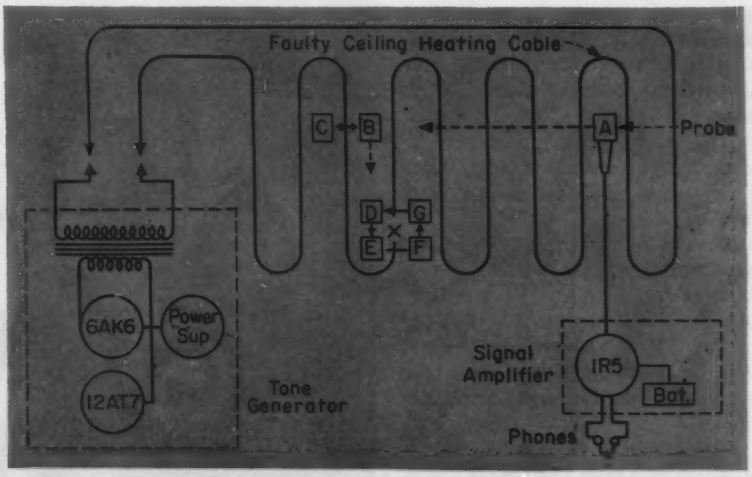
The signal amplifier is built into the probe, and its transistor requires no external power supply.

To locate a break in a ceiling heat cable, the procedure is as follows, with reference to the drawing shown below:

1. The cable is disconnected from the thermostat or control relay and connected to the tone generator.

2. The operator starts moving the probe slowly across the ceiling from one side, say A in the drawing.

3. When he reaches point B where the signal heard in the receivers decreases to or nearly to zero, he continues moving in the same direction to point C where he



SCHEMATIC shows the connections and application of the device in the process of locating ceiling heating cable break. Transistor in probe replaces vacuum-tube amplifier which was part of the original equipment

will hear the signal again.

4. He then moves the probe back to B and then at right angles to line A-C until the signal returns in full volume at point E, which indicates the break has been passed.

5. He moves the probe 1 to 1½ in. or so at right angles to line B-E to point F where little or no signal occurs.

6. He moves probe parallel to line B-E until the signal rises again at G.

7. He moves the probe toward line B-E until the signal drops again.

By connecting points DF and EG to form an X, the point of cable breakage is pinpointed.

To familiarize operators with the instrument and to assure homeowners that a break can be located easily, a sample board of cable may be set up. The board can be made from a 2x4-ft sheet of wallboard or plywood, some bell wire, and some tacks. The wire should be fastened to the board in a pattern like that of the ceiling cable's, as shown in the drawing. When the wire has been broken at any point and fastened with tape, the break can be located from the opposite side of the board.

COMMUNICATIONS

Microwave Televises 9 Meters

H. H. STROZIER, Asst Chief Planning Engineer, Georgia Power Co, Atlanta, Ga.

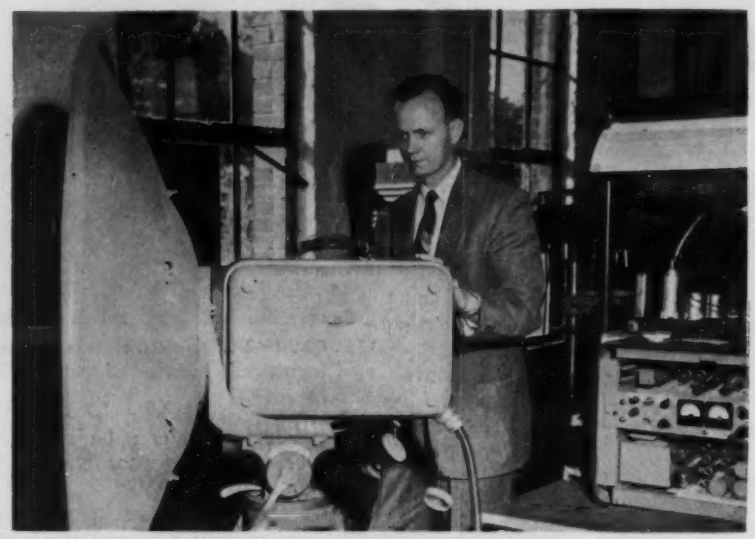
Television has been substituted successfully for telemetering by Georgia Power Co for the reading of switchboard instruments by operators at a distance from substations over which they exercise supervisory control.

In experiments at Boulevard substation, an industrial-type TV camera was focused on a switchboard in the control room. The camera's picture was transmitted by means of microwave equipment, such as is used for commercial telecasting, to a TV receiver in the load dispatcher's building some 200 yd away.

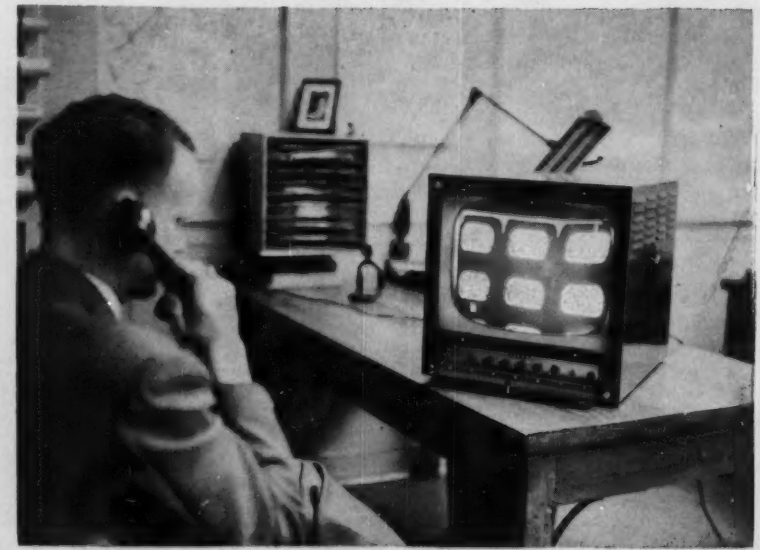
Pictures of as many as nine 5-in. meters were transmitted clearly, and their scales and indicators were legible.

As the microwave equipment is expected to operate and to give pictures of the same quality over line-of-sight distances up to 30 miles, the use of TV for supervisory control will be practicable whenever the economics are found to be favorable.

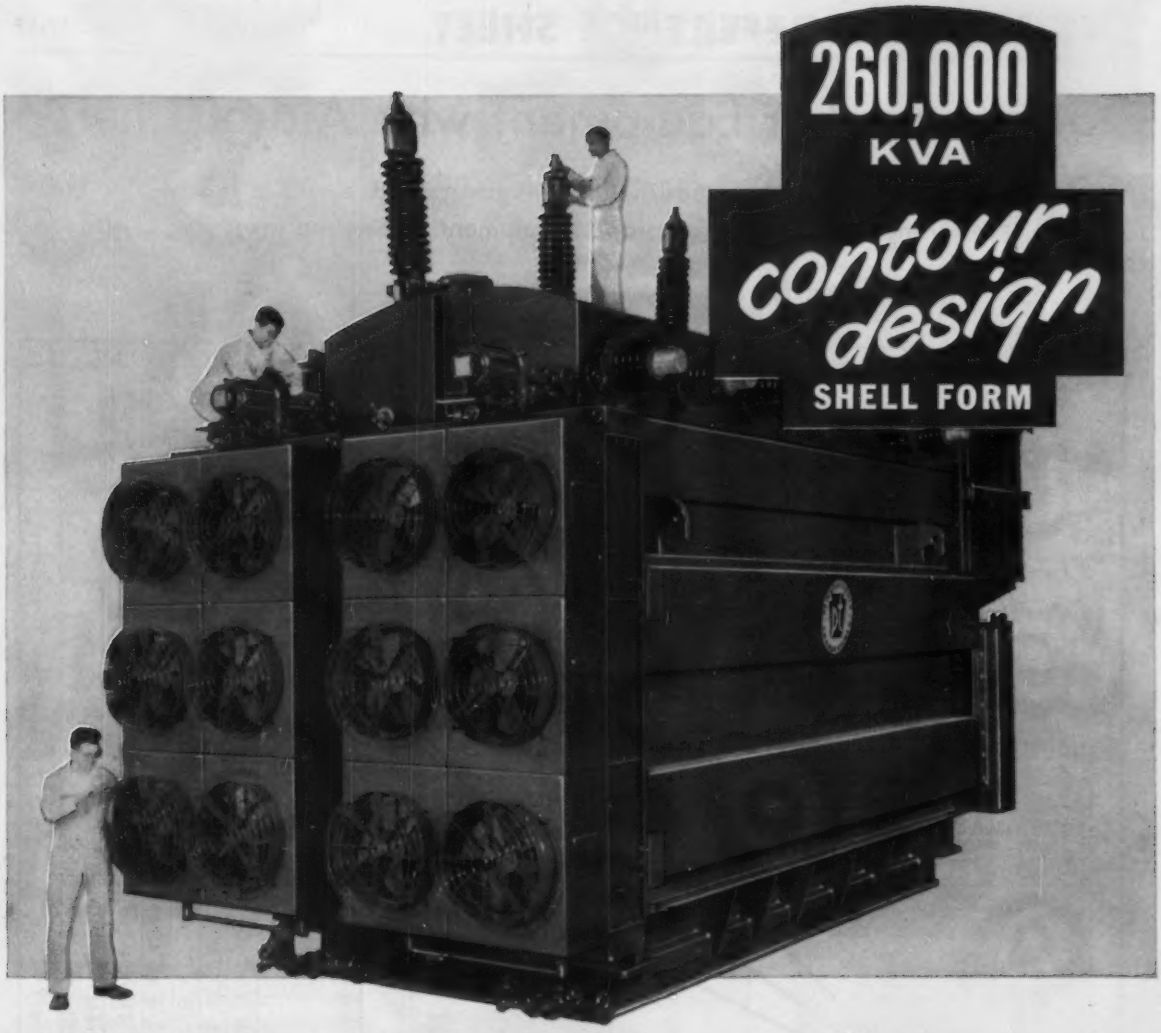
One operator, during the test, remarked that faulty equipment affects only the TV picture's legibility; it does not transmit false information.



MICROWAVE EQUIPMENT is used for transmitting the television picture of substation instrumentation. It is expected to operate well over a 30-mile distance



TV RECEIVER shows substation meters some 200 yd away. Tests demonstrated that meter scales and indicators can be viewed clearly by distant load dispatcher



PENNSYLVANIA MAIN STEP-UP GENERATING STATION TRANSFORMER

Significant savings in installation costs resulted from the upright, one-piece shipment of this large three-phase, main step-up generating station transformer. Such handling was possible because of Pennsylvania's Contour Design, which permitted the manufacture of a unit so compact that only bushings and coolers were removed for shipment.

Designed and manufactured by Pennsylvania for a midwestern utility, the transformer will step up a generated voltage of 15,000 volts to a transmission voltage of 141,000 volts. Two low voltage sections of 15,000 volts are rated at 130,000 kva each. A duplicate unit, for delivery in 1958, has been ordered. Pennsylvania Transformer Division, McGraw-Edison Co., Canonsburg, Pa.

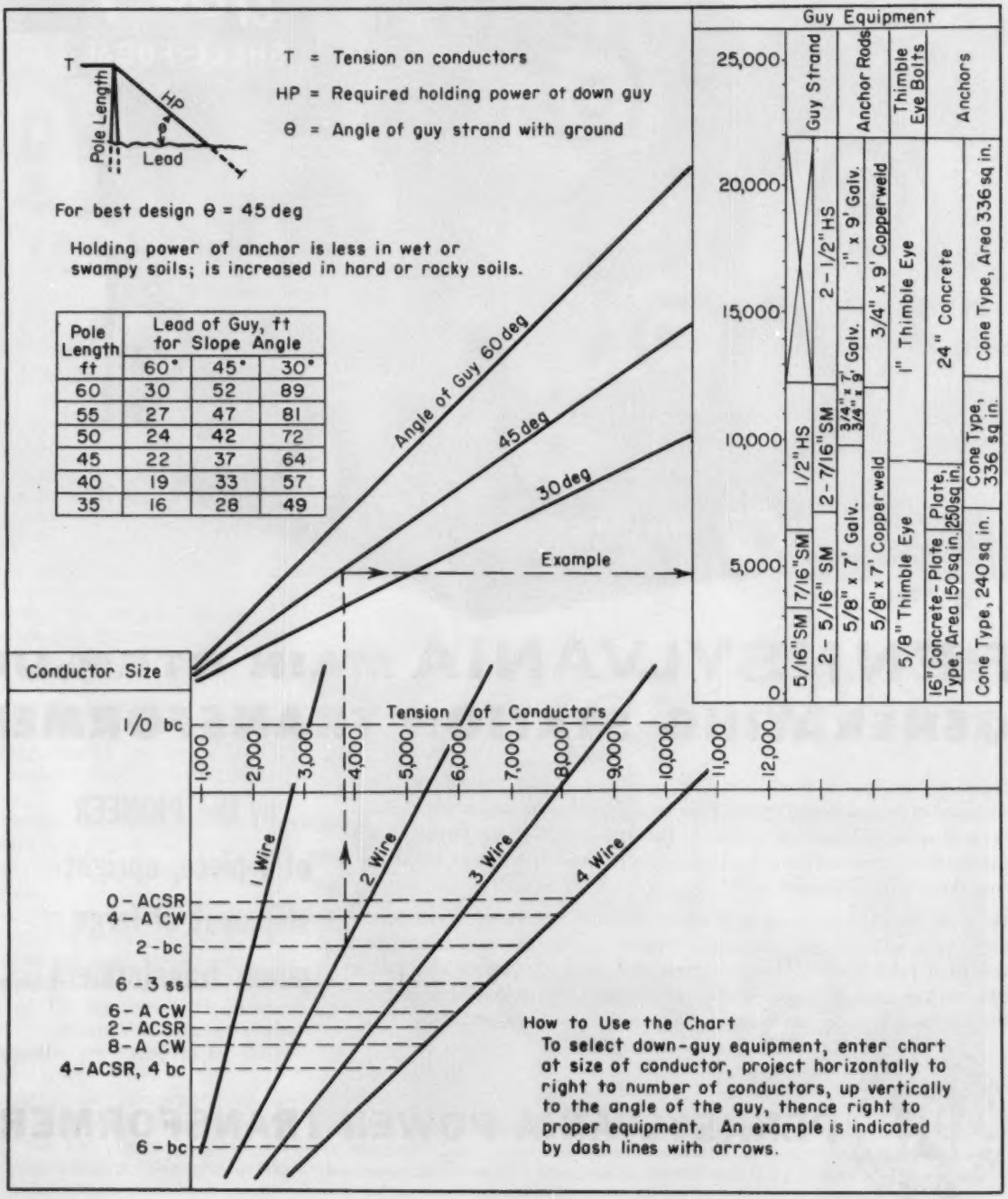
.. by the PIONEER of 1-piece, upright shipment of large power transformers

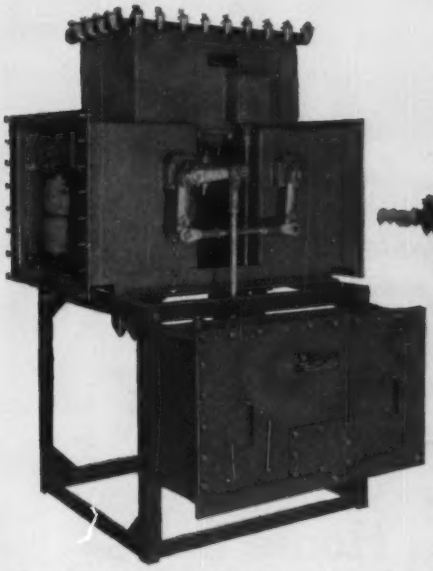
PENNSYLVANIA POWER TRANSFORMERS

Select Anchor Equipment with Aid of Chart

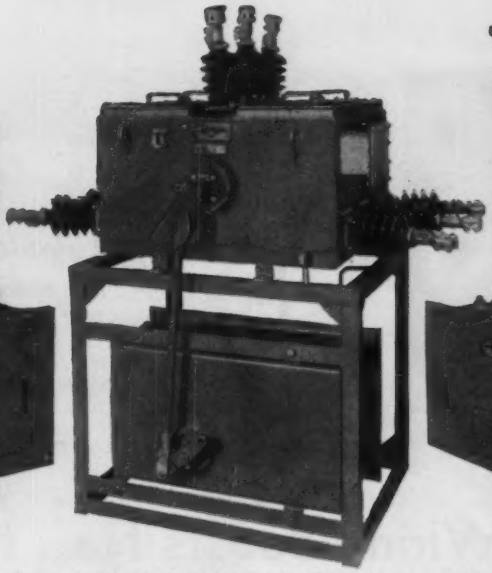
Distribution engineers and field crews are provided with a ready reference for selection of proper equipment to be used in guying

W. G. WALSTRA, Division Electrical Supt., Idaho Power Co, Twin Falls, Idaho

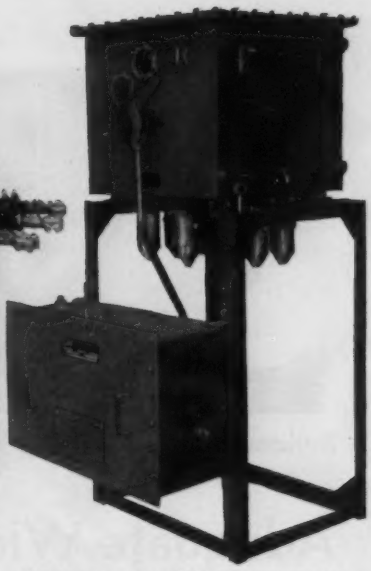




Two single throw "RA"-5Kv. automatic transfer subway oil switch.



Double throw, overhead style, 15 Kv. automatic transfer oil switch.



Double throw, "RAD"-15Kv. automatic transfer subway oil switch.

HELP INSURE ELECTRIC SERVICE CONTINUITY

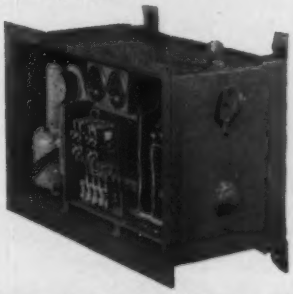
BY TRANSFERING IMPORTANT LOADS TO AN ALTERNATE FEEDER AUTOMATICALLY.

G & W Type "RA" oil switches with Model "F" operating mechanisms are furnished as practical, economical and remarkably trouble-free units for vault or overhead installations. The oil switch and mechanism case are of heavy welded steel construction, hermetically sealed. The oil switches may be double throw or two single throw units. Standard ratings—400 amperes, 5, 7.5 & 15 Kv. Special—1000 amperes & up to 34.5 Kv.

G & W automatic transfer oil switches have been giving satisfactory service since 1928.

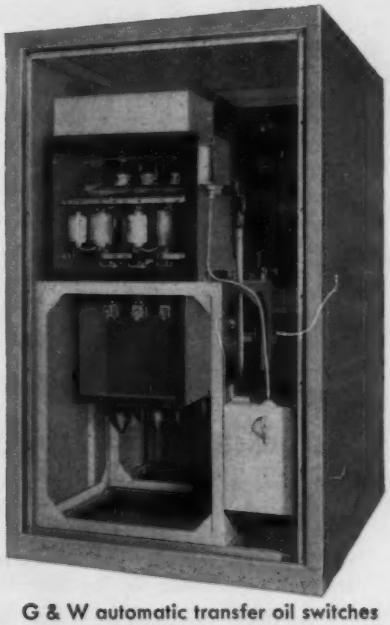
What the Model "F" Mechanism does—

- When preferred feeder voltage fails, the load is automatically transferred to the emergency feeder.
- When preferred feeder voltage is restored (for a period of ¾ minute) the load is automatically returned to the preferred feeder.
- There is no "hunting" on system disturbances. Load cannot be thrown to a "dead" source.



- Several standard and special control circuits are regularly furnished for varying requirements—for lock out in case of a short circuit on the load side—for remote operator selection of either feeder as the preferred—for automatic throwover and manual control of return.

Send for series "DA" bulletin



G & W automatic transfer oil switches are also available in UNICLAD metal enclosures to promote safety and present a neat and harmonious appearance in outdoor and indoor locations.

G & W ELECTRIC SPECIALTY CO. **3500 W. 127th St., BLUE ISLAND, ILL.**

DA571 Representatives in many cities of U. S. A., N. & S. America Canadian Mfr. – Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G & W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

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Builder installs . . .

130 NEW BRICK HOMES Being Built By
Fred Powers Jr.
LOTS DEVELOPED BY LANHOM DEVELOPMENT CO.
Materials By Knight LUMBER CO.
FIRST ADDITION IN TEXAS WITH
100% CERTIFIED ADEQUATE WIRED HOMES

then solidly promotes, as . . .

Adequate Wiring Boosts New Home Sales

R. H. BRUMMEL, Manager, Southwestern Public Service Co, Borger, Texas

Adequate wiring, billed as higher "quality" of electrical living, is selling new homes in Borger, Texas.

"Quality still sells," says Fred Powers, Jr., the builder behind adequately-wired, 130-home development in this Texas panhandle city. "Certified adequate wiring is a salable quality feature as much as materials or workmanship," according to Powers.

Powers first become convinced that customers looked and were willing to pay for a quality electrical system in a home they were considering buying when he opened his own adequately wiring home for public inspection. Visitors' interest at his "open house", their comments and suggestions, were all carefully noted for future incorporation in his homes.

Every Home A.W.'ed

Every home in the development, called "Western Panarama," will have the certified seal of Hutchison County Adequate Wiring Bureau. About 30 homes have been built so far; all are sold before construction begins. Each has a 100-amp entrance. Average number of 120-v circuits is 14 with two 220-v circuits. The houses are in the $11,000 to $16,000 range. All construction, except wiring, is handled by subcontractors. Powers takes care of the wiring himself through agreement with a local electrical contractor.

The proven sales theory—own a product, know it, sell it—is behind the Powers' home-building story. New homes are going up at the rate of about 30 a year. Powers expects to have all 130 built and sold within five years, and he plans to do it by using adequate wiring as his major selling point.

Adequate Wiring Clicks in Iowa

Iowa Electric Light & Power Co recently issued its 1,157th Certificate of Adequate Wiring since the Central Iowa Adequate Wiring Bureau came into being in mid-1953.

How and why the good results?

Mainly because the utility and its allies have concentrated on seeing that AW goes into new homes, says H. DePoy, head of IEL&P's adequate wiring activities.

The company gets information from building permits, then sends the new home owner a letter with an enclosed reply card asking for information about AW. If this doesn't get results, the owner is contacted personally.

Electricians and builders cooperate by telling the prospective owner to get an A.W. layout from the utility. Mass builders request wiring layouts for their plans. VA and FHA give added loan value for a properly wired home.

Plans are based on load information and growth given by the customer. Minimum recommendations call for 100-amp service.

It took time to build up customer interest, but the program seems to be rolling now. In 1954 there were 131 certifications, in 1955 there were 342, and in 1956, 539 certificates were given out. Builders have come to realize that AW increases the salability of their homes and makes happier customers.

WIRING BRIEFS

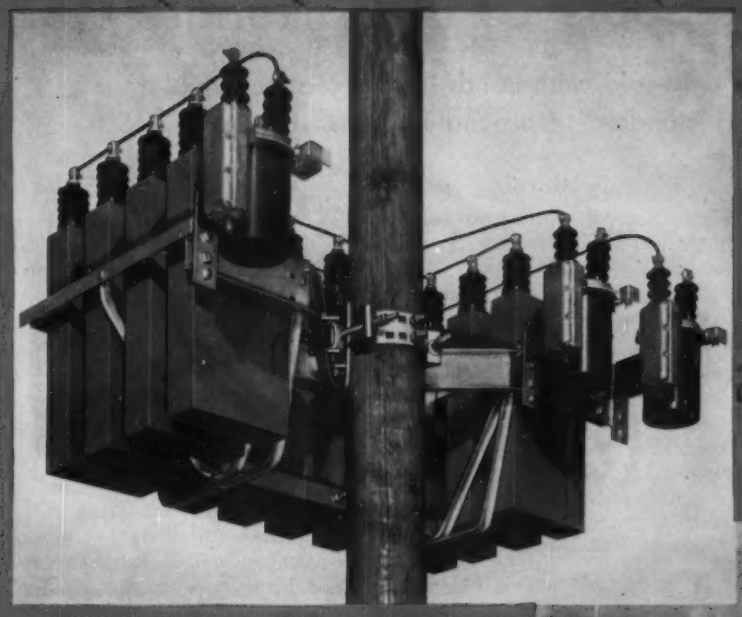
A. W. on the Rostrum

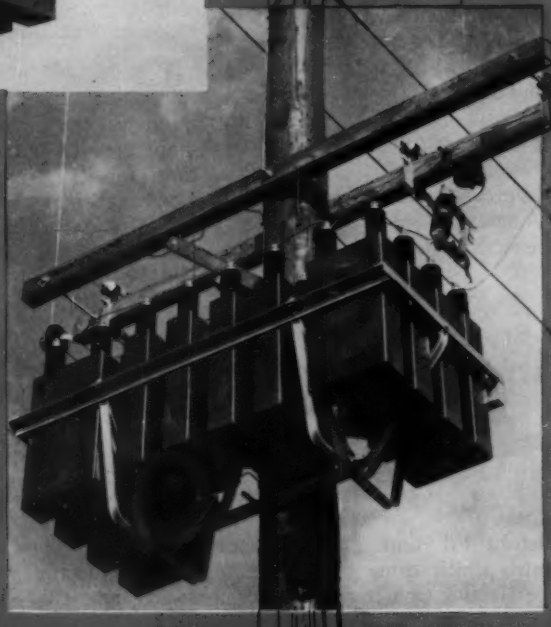
Chicago Electric Association has set up a Speakers' Bureau which will present the better wiring story wherever they can get an audience of 50 or more. They have already reached 2,500 people with the message.

'100-Plus' on the Go!

There are 25,000 homes with 100-Plus wiring in the Chicago area. The city's "100-Plus" program calls for a 100 amp service, a minimum of eight circuits plus a range circuit and a range.

(*More Selling on page* 74)





NEW!

12-UNIT CAPACITOR CLUSTER MOUNT

Compact design—maintains clear climbing space.

Easy to install—assemble and wire capacitors and oil switches on ground, hoist into position, clamp to pole (no holes required), and adjust kicker bracket.

Shipped assembled—only legs attached in field. Legs keep capacitors clear of ground.

Accommodates all standard NEMA capacitors
Other Mounts available for 3, 4, or 6 capacitors
Bulletin J2-108 available on request

JOSLYN COMPLETE POLE LINE EQUIPMENT

JOSLYN MFG. AND SUPPLY CO.

155 North Wacker Drive, Chicago 6, Illinois

Hotpoint Survey Spots '57 A.C. Trends

Pollsters see 2 million units sold, with trends toward features and larger sizes. 1-hp becoming 'standard', fractional-hp jobs are bowing out

Hotpoint Co's market research teams have come up with some figures in their recent survey of the 1957 air conditioner market. Here's the way it looks to them:

Indications are that 1957 will be the biggest year in air conditioner history. Sales are running 25.5% ahead of 1956. The industry seems well on its way to selling 2 million units this year.

Newspaper advertising is the number one medium for attracting consumer attention. 34.9% of those queried listed newspapers as the first factor which influenced them to buy air conditioners. The second most important factor, with 30% answering this one, was "saw one in a friend's home." Here's where prestige and "keeping up with the Joneses" comes into play. Other influences in the picture are "hot weather"—12.8%; "saw it in a dealer's store window or on his floor"—10.2%; and "dealer called at home"—6.5%.

Exposure to major appliances with the same brand name as that of the air conditioner is important when the customer is selecting a unit. He usually buys the name he knows. This is also very important to dealers because it gives the one with a full line of major appliances a definite advantage.

Features Get Billing

Features will play a big part in this year's sales pattern. Hotpoint estimates the industry has spent more than $5 million on new features for its '57 models. Reason: Consumer knows more and is more critical about air conditioners than before. Features are expected to provide the sales-clincher pitch.

The number one A.C. salesman is still the local appliance dealer. Here's the survey breakdown of sales outlets:

Appliance dealer—70.6%
Furniture stores—9.3%
Utilities—3.8%
Plumbing & Heating contractors—3.2%
Department stores—2.5%
Miscellaneous—5.5%

One-hp units are being adopted as "standard" by both consumers and industry, the pollsters say. Fractional-hp air conditioners seem to be going out. The ⅓-hp job is practically extinct, and the ½-hp unit is prominent only in casement installations. While the ¾-hp size accounted for about 60% of 1953's sales, it will be good for only about

(Continued on page 76)

Detroit Ed Sparks Electric Heat for Architects, Engineers

The importance of the architect and the consulting engineer in the electric heating picture was emphasized recently by a meeting held for them by Detroit Edison Co.

Detroit Ed went ahead with the meeting on the premise which came out Electrical World's Electric Space Heating Conference in December: Sell the architect and engineer first! (EW, Jan. 21, 1957, p 71).

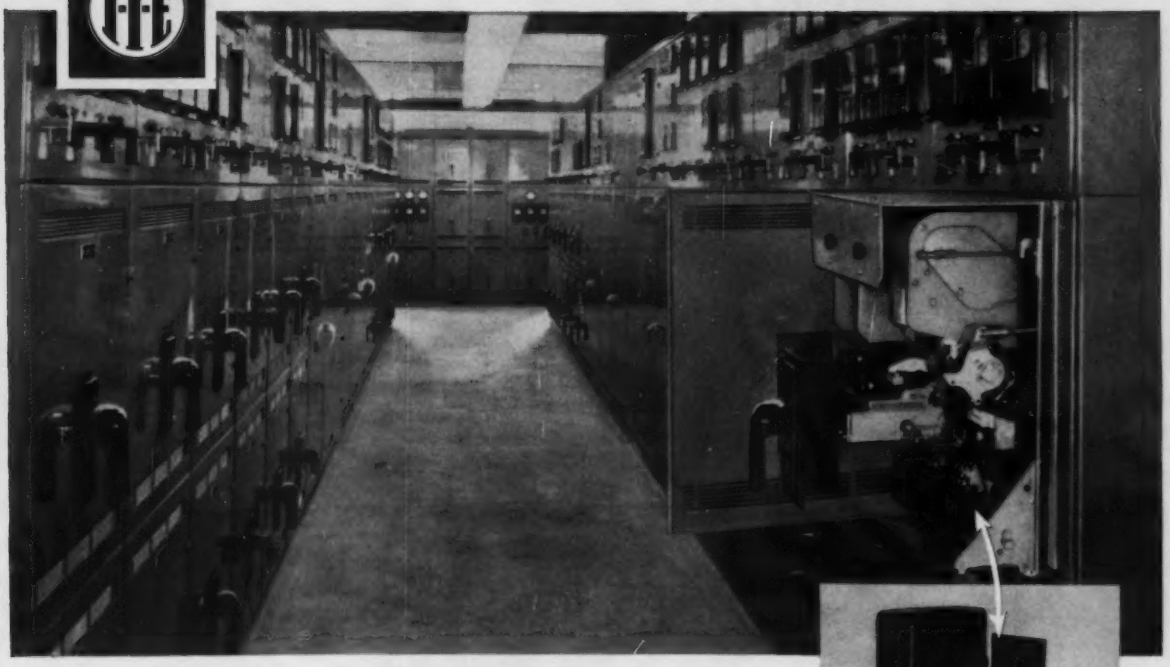
To do this, the utility went to the Detroit Chapter of American Institute of Architects, Detroit Consulting Engineers, and manufacturers representatives of electric space heating and heat pump equipment currently being marketed in the Detroit area. AIA cooperated fully, even to the extent of allowing Detroit Ed to use its mailing lists.

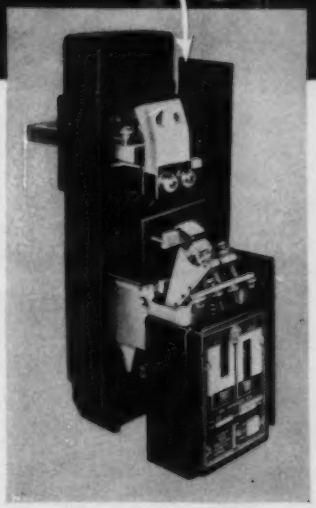
Main idea was to the give the architects and engineers a complete picture. General Electric Co's Ed Douglas covered the air-to-air heat pump, while K. Cunningham of Acme Industries Inc. in Jackson, Mich., told the story for the water-to-water unit. Bruce Spiller of Electric Radiant Heat Inc, Fort Wayne, Ind., did the honors for resistance heating. Displays of various manufacturers' equipment was set up, and guests were urged to investigate and ask questions. At the close of the meeting Detroit Ed handed out a brochure containing electric heating literature. (The utility also sent this to those who were interested, but were unable to attend.)

Detroit Ed reports the meeting was a huge success. In addition to giving its valuable professional and trade allies the electric heating story, it allowed the utility to set down its policies on the subject for all concerned.

SPEAKERS at Detroit Ed electric heating meeting are, l to r, Ed Douglas, Bruce Spiller, Ken Cunningham, and S. Sanford and A. C. Sangster, both of Detroit Edison Co

LOW VOLTAGE SWITCHGEAR





Here's SENSITIVE Circuit Protection

Some temporary overcurrents are tolerable; should even be permitted to occur. But sensitive circuit protection is needed to interrupt them when they persist too long or are of too high a magnitude.

The I-T-E Type OD-1 dual magnetic overcurrent trip device gives such protection. It permits temporary overcurrents, but limits them in duration and magnitude. This device will trip the circuit breaker after a predetermined interval on relatively low overcurrents or will trip instantaneously on high-magnitude fault currents. In either case you get safe, positive protection—sensitive to the needs of the circuit and the equipment on it.

For complete information on sensitive circuit protection, including selective tripping, undervoltage and other tripping devices, contact your local I-T-E sales representative. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

Features of the I-T-E Type OD-1 Trip Device

PRECISION BUILT and factory calibrated to provide the highest possible accuracy in operation.

SEALED SILICONE TIMING ELEMENT. No maintenance. No oil to handle, no level to maintain, no sludging.

QUIET. Resonant vibration dampeners prevent a-c noise and wear on parts.

COMPLETELY ADJUSTABLE IN SERVICE. The delay pickup is easily adjusted from 80 to 160% of the continuous current rating. The instantaneous pickup is adjustable from 500 to 1500% of the continuous current rating. The time delay is adjustable to any of three time delay bands—minimum, intermediate and maximum.

SAFE DEAD FRONT DESIGN. Insulated knobs permit safe adjustment on a *hot* circuit breaker.

DEPENDABLE impact tripping action. The *hammer blow* movement of the time delay armature at end of timing stroke gives positive operation.

FAST RESETTING. Sensitive check valve on the piston provides quick resetting of the time delay. Repeat tripping is assured.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES, LTD.

MR. DISTRIBUTION ENGINEER:

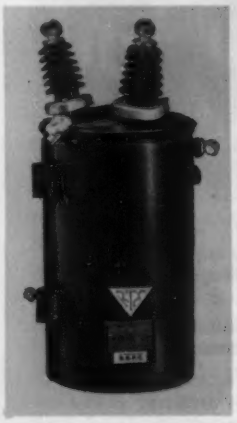
WHAT DO YOU KNOW ABOUT RT&E?

As one of the important men who distribute power to America, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, you should know that we are one of the most reliable. Since economical performance and dependability are what *you* require, you will be interested in knowing that our transformers have been laboratory and field-tested and proved to meet every requirement of rugged service.

To back up what we say, our transformers are guaranteed for five full years of service. Our losses have been reduced to increase efficiency, improve regulation and raise overload capacity. Our externally operated tap changer is standard equipment at no extra cost.

These and other exclusive features have been developed from your suggestions. RT&E makes transformers the way *you* want them made.



RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

SELLING

(*Continued from page* 74)

38% in 1957. The 1-hp meanwhile has gone from 18% in '53 to a probable 40% in '57.

Large Units Do Job Cheaper

The Hotpoint survey sees the same trend for 1½ and 2-hp units. In 1956 the industry ran out of these sizes halfway through the season. This means the customer recognizes that it's cheaper to cool with a single larger unit than it is with two or three smaller ones. Odds are on the 2-hp job to triple its 1956 sales in 1957.

Most A.C.'s Go Into Homes

Where have all the air conditioners been going?

Homes have taken 65% of them, businesses accounted for 20%, and apartment houses have the remaining 15%. Business properties such as retail stores, professional offices, motels and hotels make up a $50 market that can't be touched by any other major appliance, according to one Hotpoint spokesman.

Location of the air conditioners has remained pretty much the same.

Price range of homes appears to be important. 55% of air conditioner owners value their homes between $10,000 and $25,000; this is an increase of 7% over last year. However, the age of the house doesn't seem to matter much. Percentage of air conditioner sales fell close to each other regardless of the house age bracket.

Prof Says More Insulation Means Lower Costs

Home builders can build and space-condition their houses at lower construction and operating costs by using considerably more insulation than required by FHA standards, according to J. R. Watt, associate professor of mechanical engineering at University of Texas.

Watt bases his contentions on data taken from eight houses in the "Air Conditioned Village" in Austin, Texas.

Watt claims that the extra insulation cuts down on the heat gain (or loss) enough to allow the home

owner to use a smaller cooling (or heating) unit. Says Watt, "Each dollar spent on adequate insulation for air conditioning above current MPR requirements saves $1.82 in otherwise required equipment, a net saving of 82¢." And again, reoperating costs: "Each dollar's worth of insulation above current MPR requirements reduces annual average operating cost by 63¢." These operating figures are based on national average costs of equipment and fuel . . . 10¢ an effective therm for gas, 2¢ a kwhr for electricity, and 25¢ per 1,000 gal for water.

These conclusions, if they are tried nationally and prove valid, present a golden selling point for electric heat.

Savings Vary Over Country

Watt went on to estimate savings for different regions in the U. S.

In North and Central States—

a. In homes equipped with all-year heating-cooling systems of about 2 tons capacity, adequate insulation saves as much as, or more than, its own installed value in equipment cost.

b. Where cooling load exceeds 3 tons, more insulation can save well over its installed value by allowing the use of 3-ton equipment that might otherwise take four or five-ton jobs.

In South and Southwest States—

a. In homes equipped with all-year heating-cooling systems of about two-tons capacity, insulation above FHA requirements saves in equipment costs up to 1.78 times its own installed value.

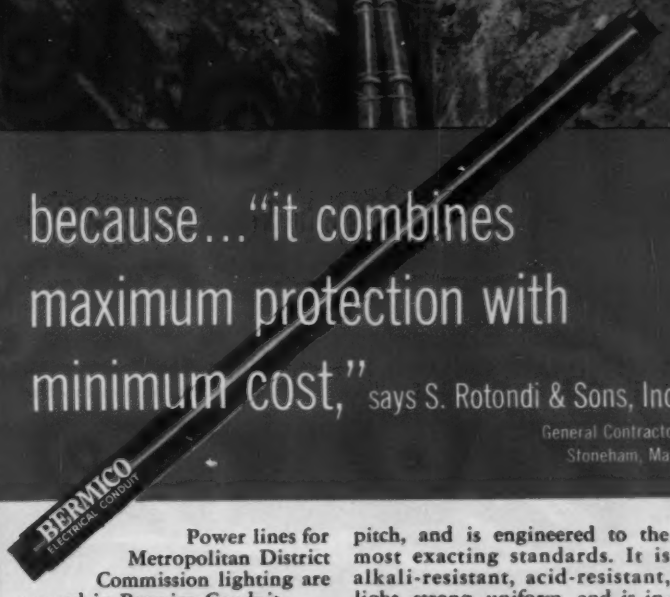
b. Where the cooling load in an isolated residence exceeds three tons, use of extra insulation can save up to 3.05 times its installed value by making three-ton equipment permissible in place of non-standard four-ton or five-ton units.

Insulation in homes studied was: Walls—2 to 3 in.; ceilings—4 to 6½ in. These same houses, if built according to FHA standards, would need (1) no insulation in walls, and (2) only the equivalent of 1½ in. in ceilings. Insulation in all eight homes was entirely mineral wool.

Homes, in order to give typical results, had varying exposures, occupancy patterns (with and without children; both adults working; etc), several types of construction, and different heating systems.

BERMICO® electrical conduit
used in new Boston parkway system

because..."it combines maximum protection with minimum cost," says S. Rotondi & Sons, Inc., General Contractors, Stoneham, Mass.



Power lines for Metropolitan District Commission lighting are encased in Bermico Conduit.

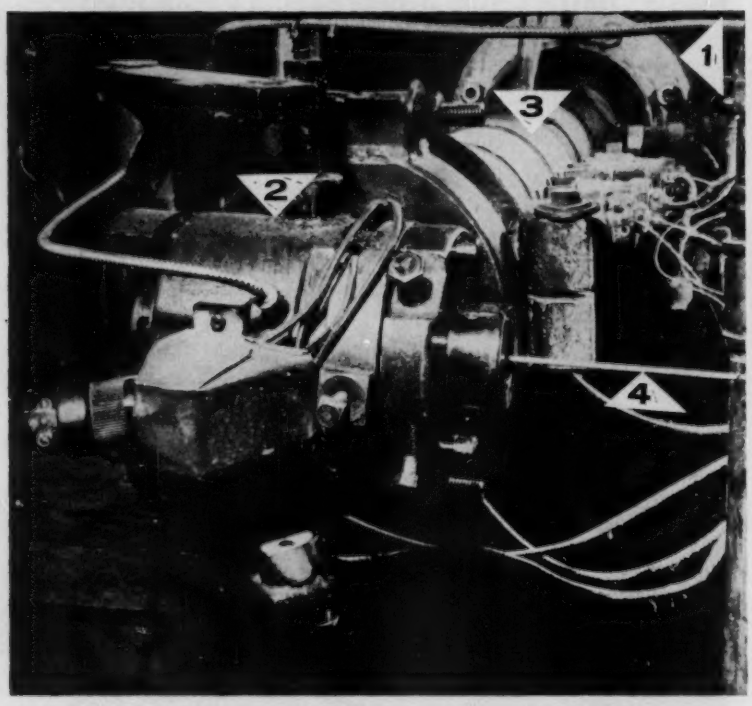
The installation, shown above, is along Route 28, Medford, Massachusetts, and is part of the new metropolitan parkway system around greater Boston.

Bermico Conduit is made from cellulose fibre impregnated with pitch, and is engineered to the most exacting standards. It is alkali-resistant, acid-resistant, light, strong, uniform, and is installed quickly and easily. Bermico Conduit is specified by public utilities and by consulting engineers from coast to coast. For speedier cable installation specify Bermico Conduit. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electric Supply Company
Offices in principal cities

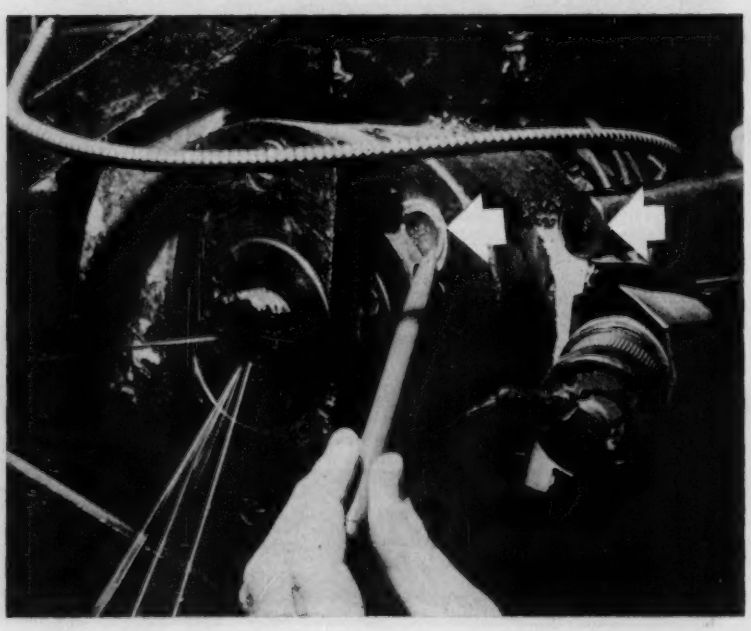
BROWN COMPANY
BERLIN, N. H.
General Sales Office: 150 Causeway Street, Boston 14, Mass.

Temperature Control Key to High Output



IN 4-FT RUN from hopper (1) to extrusion head (2), seven strip heaters (3) turn solid vinyl pellets to liquid plastic to insulate wire (4) moving 700 fpm

FOUR 500-W CARTRIDGE heaters, inserted in extrusion head, hold melted insulation precisely at 360 C, insure proper application with minimum of scrap



J. F. RICHARDSON, Power Sales Engineer, The Cleveland Electric Illuminating Co, Cleveland, Ohio, and

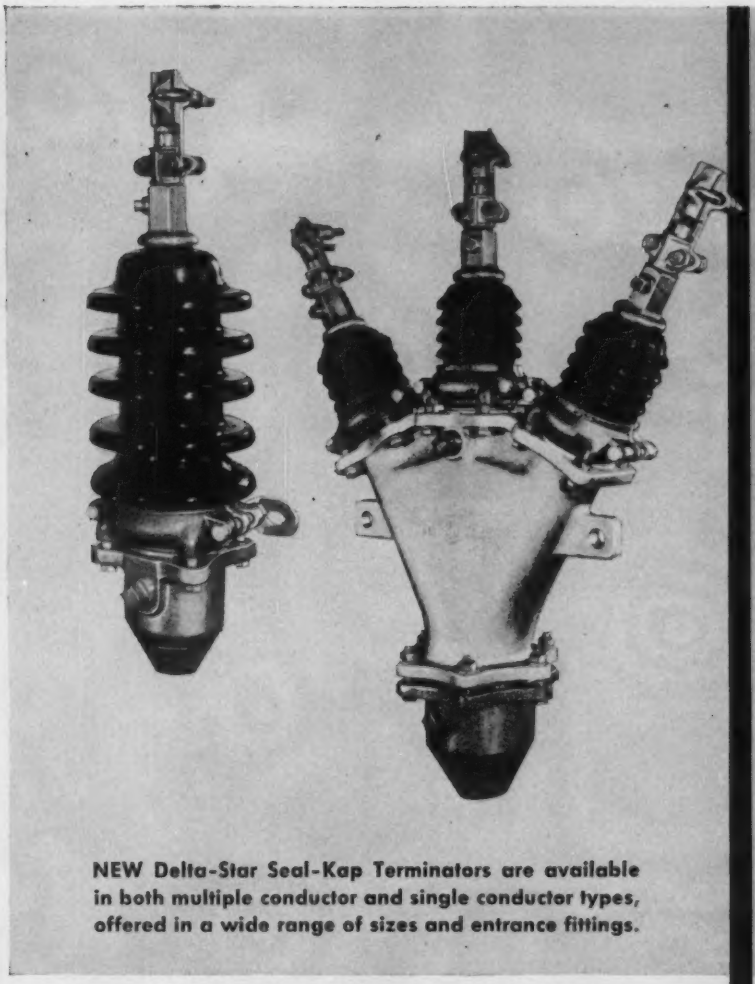
MURRAY H. SHAW, Power Sales Engineer, The Cleveland Electric Illuminating Co, Cleveland, Ohio

In a run of only four feet, eleven electric heaters at the Radix Wire Co, Euclid, Ohio transform hard, vinyl pellets into a soft, fast flowing plastic, used to insulate wire travelling almost 700 feet per minute. Speeding from hopper to extruding head through a 3.5-inch cylinder, the plastic reaches a temperature of exactly 360F by the time it is fed onto the fast moving wire. Since the smooth, easily applied electric heat was installed, scrap losses have fallen to only ¼ of 1%, most of which is footage used to set up a production run. The installation has speeded up production to almost 3,000 miles of the wire a month.

In addition to providing better temperature control, the electric heaters can be spotted close to the material to reduce the temperature gradient between the heat source and the plastic. Seven 2.5-kilowatt strip heaters, wrapped around the cylinder, produce the bulk of the heat. Inserted in holes drilled in the extruding head, four 500-watt cartridge heaters maintain the plastic at the right temperature to assure a proper flow. Heaters are wired in four banks, each thermostatically controlled to within ± 5 degrees to provide proper heat level and plastic consistency for a quality product.

Industrial Heat Contest

A $200 first prize, two $100 prizes, and four $50 prizes are offered for electric heating installations growing out of the I. E. C. metal sheath heater courses given by approximately 30 electric utilities. Entries must state type of heater, control, and insulation, and reason for selecting electric heat. They should be sent, with a sketch of installation, to local utility industrial sales department.



NEW Delta-Star Seal-Kap Terminators are available in both multiple conductor and single conductor types, offered in a wide range of sizes and entrance fittings.

Cutaway of Seal-Kap Terminator conductor showing air-tight O-ring neoprene gasket at porcelain-to-metal joints.

Cutaway of Seal-Kap Terminator base showing pressure-tight seal, at metal-to-metal joints.

NEW, advanced line of DELTA-STAR *Permanently-Sealed* Terminators

The big feature of this new line of Delta-Star Seal-Kap Terminators is the permanent-seal construction—using pressure-tight O-ring neoprene gaskets at all joints. The terminator is permanently air-tight and moisture proof, with a partial vacuum created inside it.

Insulating oil and compound inside Seal-Kap Terminators cannot escape even when heating causes expansion. Many sealing arrangements are used on terminators, but none is more effective than the new Seal-Kap method.

Among other Seal-Kap advantages are economy in original cost—and economy through ease of installation and maintenance.

A range of sizes is available to meet most terminator applications—in both multiple and single conductor types. Get complete information—just ask for the new Seal-Kap catalog.

For your best *new* buy in terminators, call on *Delta-Star Electric Division, H. K. Porter Company, Inc., Chicago 12, Illinois. District offices in principal cities.*

DELTA-STAR ELECTRIC DIVISION
H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, H. K. Porter Company (Canada) Ltd., Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings.

Clear across the country at half the cost . . . *with Dow Brush and Weed Killers*

Men with axes and machinery used to sweat out the job of keeping this right-of-way clear. And what they cut one year would be back waiting for the blade the next.

Now this trained crew keeps the way clear at half the cost . . . with Dow brush and weed killers. And their job

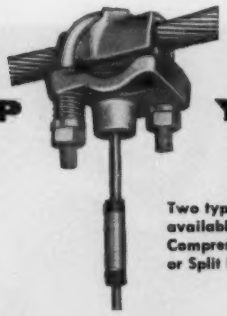
gets simpler all the time. After an initial treatment, it's just "touch-up and go" during following seasons because you get progressive control with Dow chemicals.

No matter what vegetation problem they run into along the way, they have a specialized Dow herbicide to whip it. For brush they use Esteron® 245, Kuron® and Esteron Brush Killer. To control both broad-leaf and narrow-leaf weeds in substations and pole-yards, they apply Baron®.

Whether your own crew or a professional spraying contractor does the job, you'll find Dow chemicals can cut your vegetation-control bill in half. Learn more about this cost-saving way to keep your rights-of-way full size and clear for easier maintenance, construction and patrol. Write to: THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemical Sales Dept., Midland, Michigan.

YOU CAN DEPEND ON DOW

A U-BOLT CLAMP YOU CAN WORK HOT!



Two types of taps available: with Compression Fitting or Split Bolt

BLACKBURN

Choice of Alumilited Hex Nuts or Plated Malleable Basket Nuts

Here's a hot line clamp with all the advantages of a U-bolt connection. Reduces costly service calls and burn-downs. Costs more than conventional hot line clamps—*and worth it!*

Castings and hardware of aluminum alloy. Standard tap of tin plated bronze—compression tap of aluminum.

Main—3/0 to 336.4 ACSR—4/0 to 400 MCM AWG
4 to 2/0 ACSR over Armor Rod
Standard taps—from 6 AWG to 2/0 AWG
Compression taps—from 6 to 1/0 AGSR

Patent Applied For

SWIVELOK

Hang over conductor with shotgun stick...

Slam it home and let up on stick.

Up it pops, making instant contact. Lower casting provides wiping action to prevent arcing.

Tighten nuts and you have a trouble-free connection.

*Send for your **FREE SAMPLE** Today!*

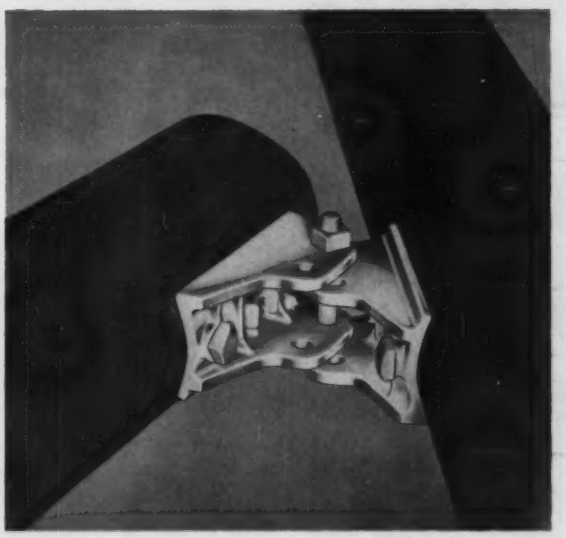
JASPER BLACKBURN CORPORATION
1525 WOODSON RD., ST. LOUIS 14, MO., WYDOWN 3-9430

NEW EQUIPMENT

Hydraulic Earth Bore

This suspended, hydraulic earth boring machine is said to dig holes up to 7 ft deep at any angle to 90 deg, for diameters between 11 and 22 in. Designated as the Model B digger, it reportedly can be front or rear mounted on any line construction body with any hydraulic derrick. Two reversible, independent hydraulic motors drive auger and feed mechanism. Drive chain crowd assembly reportedly assures smooth, rapid downward digging. Flight auger with hole trimming blade cuts hole to diameter desired. Digger is suspended from derrick swivel to provide freedom of movement, permit pivoting to dig holes for anchoring. Digger can be positioned so derrick is free for pole-setting operations.

Highway Trailer Co, 405 E. Fulton St, Edgerton, Wis.



Spar Connectors

These universal angle spar connectors reportedly can be used to join round members in wood pole structures at any angle up to 90 deg. Smaller, light duty fitting attaches to each member by single bolt; larger fitting, illustrated, uses single bolt for medium duty, two bolts on each member for heavy duty.

Curved, pole contacting surfaces fit range of diameters. Manufacturer claims little drilling and no gaining is necessary. Applications include single pole, A-frame and H-frame structures, push braces, and other special purpose structures.

Malleable Iron Fittings Co, Pole Hardware Div, Branford, Conn.

Guy Protector

Intended for areas where industrial gases or seacoast atmosphere cause abnormal corrosion of steel, aluminum alloy guy protectors are available in two models: AL-27, 7 ft long; No. AL-28, 8 ft long.

Weight is said to be only about half that of steel protectors. It is a half-round design, with edges turned in lengthwise for added strength. Attachment holes are spaced for universal application to guy wire. Bottom bolt is 2.5-in. long, permitting attachment over rod or strand between eye and clamp. Installation can be made on clamp by substituting protector bolt for one clamp bolt.

Hubbard & Co., 6301 Butler St., Pittsburgh 1, Pa.

Megohmmeter

A plug-in type, high resistance megohmmeter, the Model 35A Myria, is calibrated both in conductance and resistance. It covers the range of 50,000 ohms to 200,000 megohms and has fixed test potentials of 100 and 500 v dc. It is said to be suitable for testing highly capacitive circuits. Maximum short circuit test current is 10 milliamps.

Instrument operates from 100 to 120-v or 200 to 250-v, 40 to 60-cps line. Reported accuracy is $\pm 1.2\%$ full scale reading expressed in conductance.

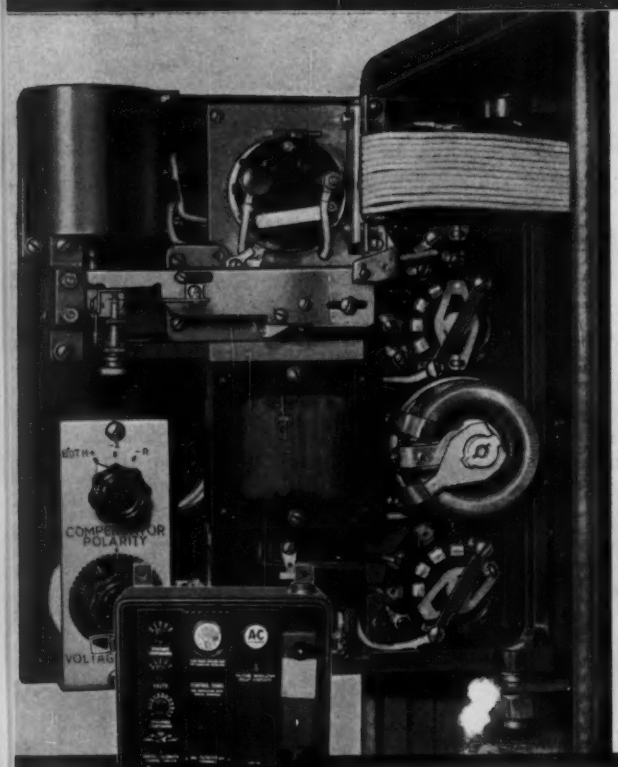
Herman H. Sticht Co,
27 Park Place, New York, N. Y.

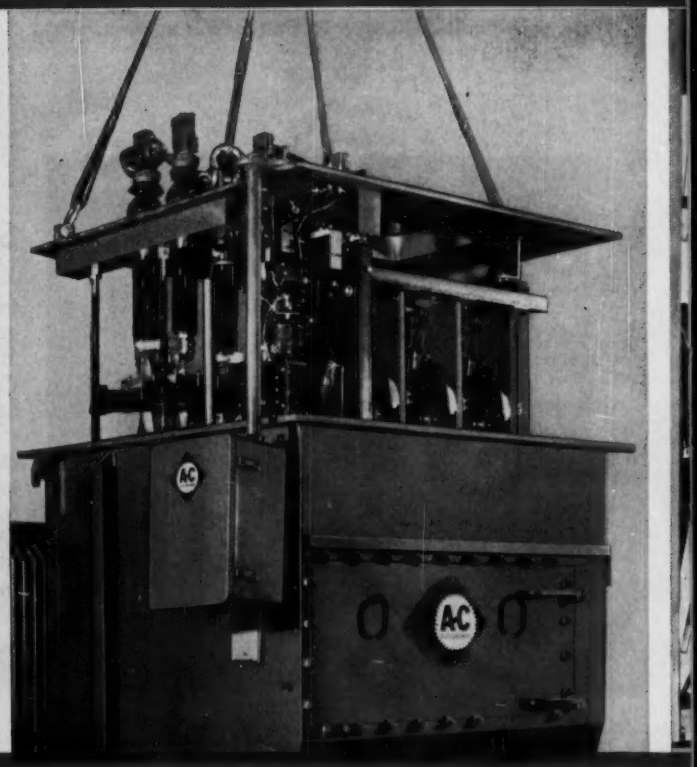
(More New Equipment on page 86)

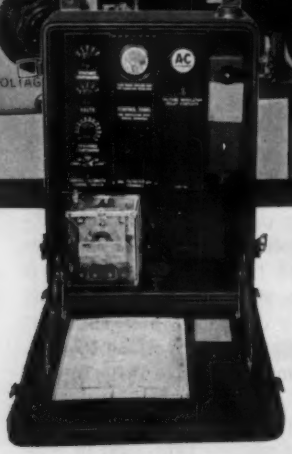
Allis-Chalmers three-phase

Always a step

Continual engineering development and laboratory testing produce constant regulator improvements.







New control panel

Handy control diagram on inside of panel cover . . . nickel-plated parts . . . stabilizing coil on solenoid of voltage-regulating relay . . . readily accessible contacts on voltage-regulating relay . . . rustproof plastic coating on open edges of control cabinet . . . and many other features.

New gear motor

Acceptance tests for gear motors include breakdown testing in hot transformer oil. Motors are driven against a mechanical stop and must survive at least 40,000 operations (equivalent to 5 million tap changes).

Vari-Amp is an Allis-Chalmers trademark.

In addition to all these improvements, unit construction, *Vari-Amp* and all the other original features make this the leading regulator. For complete details, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-5392

station step regulators

ahead

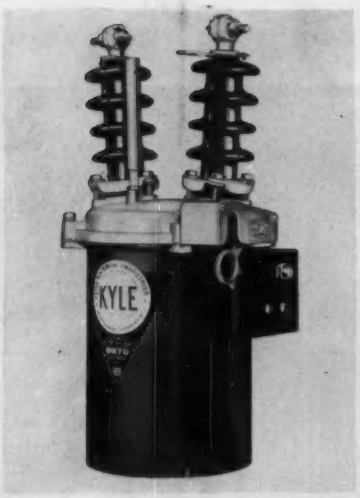
New reliability

Locking devices are engineered to meet requirements of long life. Shown are locking strips, double nuts, prick-punched lock nuts and lock washers, as well as wired bolt heads.

New painting techiques... hinged door...skid mounts

1. **Better finish** results from continuing study . . . adds service life under any atmospheric condition.
2. **Inspection door** has reusable synthetic gasketing that fits into a groove . . . permits tightening down metal-to-metal contact.
3. **Skid mounts** permit easier movement of regulator in either direction . . . add strength and rigidity.

ALLIS-CHALMERS



Oil Sectionalizers

These automatic oil sectionalizers are said to have increased continuous current and short-time current ratings. Current ratings include 5, 10, 15, 25, 35, 50, 70, 100, and 140 amp. Short-time ratings range to 1,800 amp for 10 sec., 4,000 amp for one sec., and 6,500 amp of momentary asymmetric current.

Designated type GH, they are rated 14.4 kv but can be used for circuits down to 2.4 kv. They are reportedly designed to improve service continuity by permitting additional recloser-sectionalizer use. New contact design is said to allow increase in current rating.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Chain Hoist

A lightweight electric chain hoist, said to be safe, durable and easy-to-use, is available with two types of reeving: 300 to 2,000-lb capacity, single-chain unit; 3,000 to 4,000-lb capacity, double-chain. Clearly marked handles permit one-hand control of up and down travel.

Reported lifting speeds are 15 to 3.75 fpm with 93 to 113-lb net weight for 115- and 230-v, single-phase motors; 30 to 5 fpm with 93 to 129-lb net weight for 220/440-v, reconnectable 3-phase rotors; and 20 to 10 fpm with 102 to 129-lb net weight for 550-v, 3-phase motors.

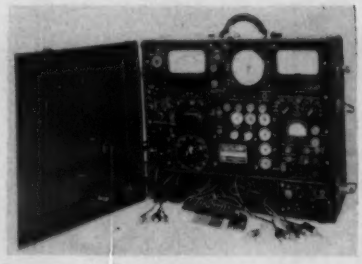
American Chain & Cable Co, Inc, Wright Hoist Div, York, Pa.

High Potential Testers

Three mobile high potential d-c testers known as Hypots feature low ripple output and individual metering of actual voltage and current output. A sealed rectifier-amplifier, using selenium rectifiers, reportedly keeps all high potential components oil insulated and corona free.

Intended for testing dielectric strength, dielectric absorption, and high voltage insulation resistance in cables, generators, transformers, capacitors, motors, and insulation, they can be used to meter either load (leakage) or bypass (guard) currents. Model 5265 has d-c outputs of zero to 45 kv in three ranges; Model 5280 outputs of zero to 75 kv in three ranges; Model 5275, outputs of zero to 70 kv in a single range.

Associated Research, Inc, 3760 W. Belmont Ave, Chicago 18, Ill.



Relay Test Set

A portable relay test set, Model 61-V3-DC, is said to be useful for field or bench testing of current, differential, distance, impedance, overload, power, product, reclosing, timing, voltage, and other types of protective relays.

Reported features include two independently adjustable currents for differential and directional relays; a voltage output for voltage relays; an 8-v dc output for testing targets and seal-in units; a 150/300-v d-c output for miscellaneous testing; a continuity indicator; and separate 1% a-c ammeter, d-c ammeter, and ac-dc voltmeter.

Continuous duty rating is 0.4 kva, with extensive overload capacities. Four high current ranges include zero-100 amp with 4-v max. and zero-12.5 amp at 32-v max.

Multi-Amp Corp, P.O. Box 217, 465 Lehigh Ave, Union, N. J.

Speed Recorder

Reported to measure and record speeds with an accuracy of $\pm 0.1\%$, this recorder is designed for use with d-c tachometer generators. Unit can be calibrated in rpm, feet per minute, or other similar units.

Reading is obtained by measuring difference between tachometer voltage and a precision reference. Total speed range is subdivided into a number of smaller ranges, each with individual reference voltage, to increase accuracy and readability. Additional error from reference voltage and precision resistors is said to be not more than 0.1%. Bulletin GEC-1377 has more data.

General Electric Co, Schenectady 5, N. Y.

Protective Relay

Here is a relay designed to protect a transformer and its 3-phase induction motor load from damage due to voltage unbalance, single-phasing, or motor overload in installations where motors are connected through breakers with undervoltage trip. Based on symmetrical components principles, it operates on a current-time curve, with a time delay of approximately two minutes.

It is said to accommodate a temporary voltage unbalance of 14% or a momentary loss of one phase before operating. This feature is said to avoid unnecessary stoppages but provide adequate protection against transformer and motor failures.

Electrical Service Co, P. O. Box 1039, Greenville, Texas.

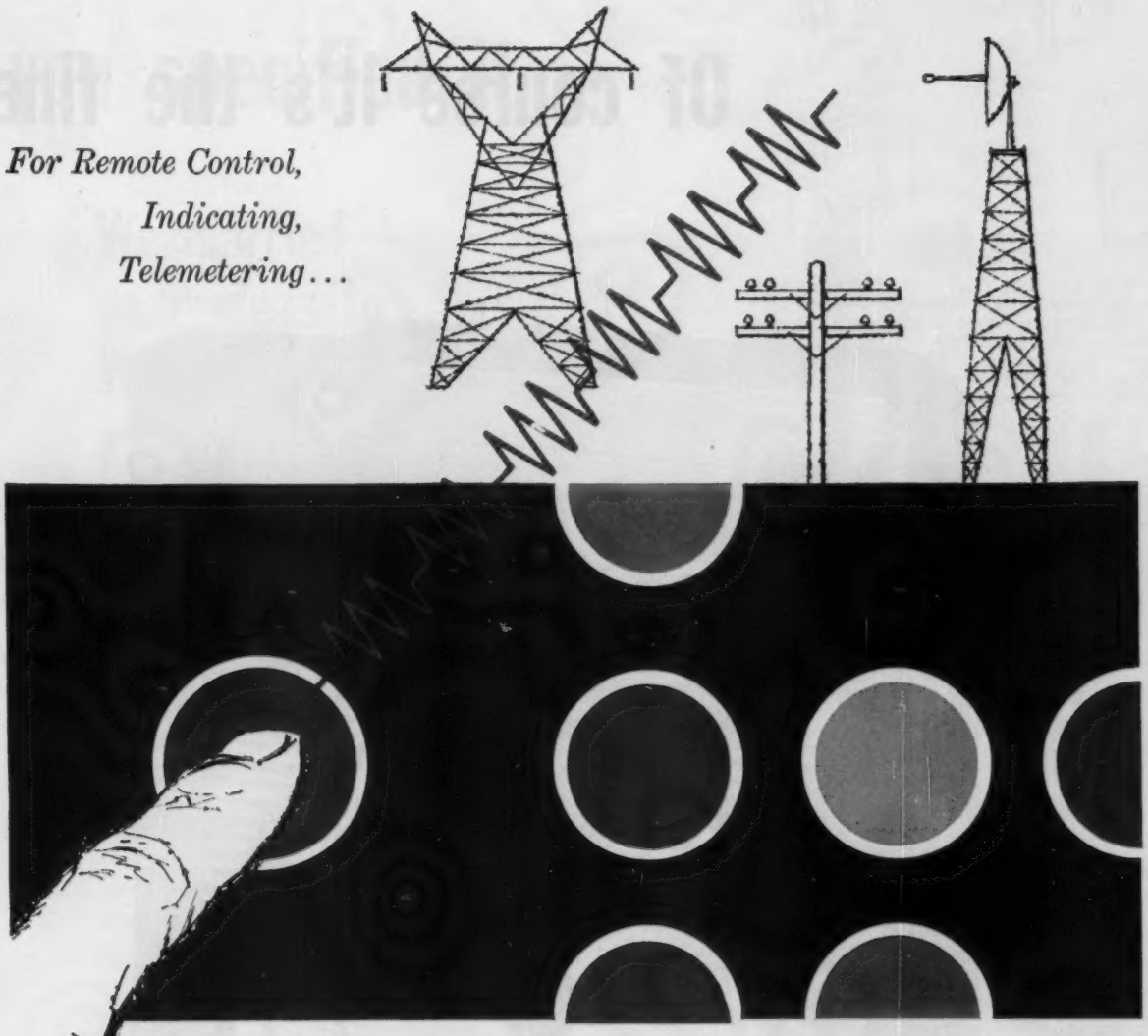
Rod Puller

This rod puller is especially made to facilitate rodding of long conduit lines where rod weight becomes a controlling factor. It will work from any point in the rod and can be used either for pushing or pulling by reversing the tool. It is said to be made of the best grade malleable steel and to be designed to prevent cutting or injuring rod.

T. J. Cope, Inc, Third & Walnut St, Collegeville, Pa.

(*More New Equipment on page* 90)

For Remote Control,
Indicating,
Telemetering...



WESTINGHOUSE SUPERVISORY SYSTEMS ...TOP DEPENDABILITY AND ECONOMY

Westinghouse built the *first* supervisory system thirty-five years ago—and it's still in everyday dependable service. Westinghouse has developed and built systems of every type, and today, as always, builds systems which excell in reliability and efficiency. They simplify your control communications and cut your operating costs by using inexpensive narrow-band channels instead of voice channels—on wire lines, power line carrier or microwave.

You can get full particulars from your Westinghouse sales representative ... or by writing direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., requesting descriptive bulletin 32-450 and reprint 4569.

J-60928

YOU CAN BE SURE...IF IT'S Westinghouse

Of course it's the finest

Type 45 Circular Chart Recorder

. you specified it

We married your ideas to Westinghouse quality

It's new. It's versatile—designed for switchboard mounting or complete portability. It has a unique and exclusive sealed inking system. We can't cover all the special features in the space here.

But the features are the ones *you* wanted—specified when we asked questions of hundreds of engineers and operating men in a predesign survey.

Type 45 is rated at 2% accuracy—but can readily be supplied and guaranteed at 1%. It is weatherproof—neoprene-gasket-sealed—fabricated from corrosion-resistant aluminum alloy. Sapphire bearings are spring mounted to absorb shock. Terminals are in an enclosed housing.

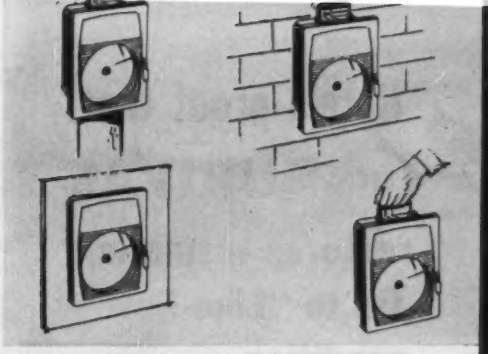
And you get the plus benefit of circular chart recording—more information on less paper, convenient to store and file—less operating cost.

It surely is *your* instrument. You can get all the details—and see a sample—by calling your Westinghouse sales representative. Or you can write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., requesting booklet B-7212 and catalog section 43-450.

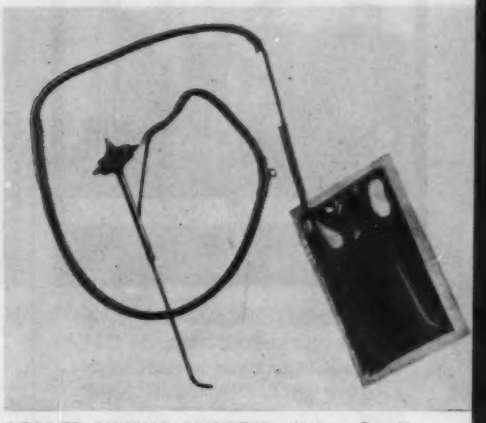
J-40496

YOU CAN BE SURE...IF IT'S

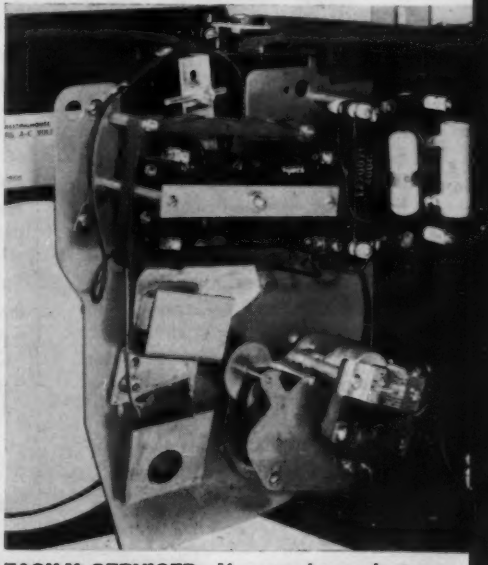
Westinghouse



CONVENIENT—Suitable for flush or projection mounting on a switchboard. Styling coordinated to match other Westinghouse instruments. Portable, too. Adjustable brackets for pole or wall mounting. Clocks either synchronous or 8-day hand-wound. Interchangeable gears for one- or seven-day chart speed. Three-day gears available.

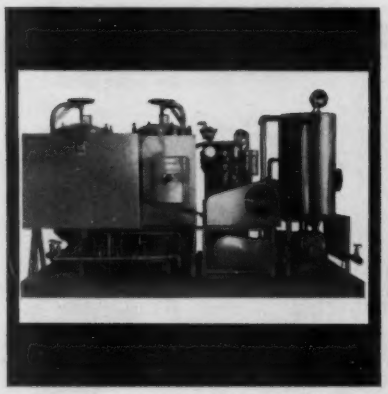


SEALED INKING SYSTEM—Unique for direct-acting electrical instruments. No inkwell. The ink is in a plastic sac, with a plastic tube to the pen. Ink supply lasts a year. No coagulation or evaporation. Pen is Inconel, stainless and corrosion-proof. Tip is platinum-iridium to assure sharp, continuous record.



EASILY SERVICED—You can change charts with your gloves on. Zero adjustment is accessible from open front cover. Built-in pen lifter saves fumbling, misalignment—automatically resets when cover is closed. Entire movement mounted on hinged panel. Just disconnect terminals and lift out. Recorder does not have to be level to operate perfectly.

Here's proof that CFC PURIVAC restores Insulating Oil to "Like-New" condition . . .



Controlled laboratory analysis proves conclusively that the CFC Honan-Crane Purivac restores insulating oil to "like-new" condition:

	Untreated Oil	After PURIVAC Treatment
Neutralization Number	0.60	0.08
Dielectric Strength	22KV	35KV
Interfacial Tension (Dynes)	15	35
Color (NPA)	4½	2

Purivac purifies, dehydrates and degasifies insulating oil in one automatic operation. Purivac indefinitely extends the life of insulating oil in transformers, circuit breakers, oil-filled cables, and switch gear. Purivac operates in the field on energized equipment or at central reclaiming stations.

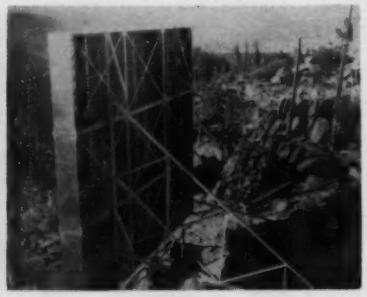
Eliminate costly transformer cleaning operations with Purivac — a complete system that has been proved *effective* in the laboratory and in the field.

COMMERCIAL FILTERS
CORPORATION
MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

Voltage Regulator

This automatic voltage regulator has no tubes, transistors, or moving parts and is intended for use in microwave relay stations or other remote installations where little or no attention is possible. Known as the Stabline type TM7101, it operates on 95 to 135-v, 60-cps input and is rated 1 kva. Accuracy of 1 volt band for line or load variations is claimed.
Superior Electric Co, Bristol, Conn.



Passive Repeater

This passive repeater can be installed at a reflecting point when no line of sight exists between stations. It can be erected in remote locations without power supply. It has been used at 2000 and 6700 mc.

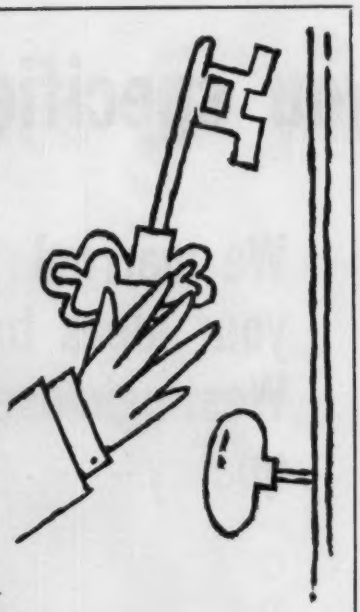
Repeater is furnished knocked down, complete with reflecting panels and all structural members except footings. Unit is preassembled at factory to test over-all flatness to within ¼ in.

Panels are 0.064-in. aluminum, riveted to frame. Field erection is said to require no motor crane. Assembly is bolted throughout. Heavy rear bracing provides rigidity to 60-psf wind loads (164 mph).

Panels are available in 8x10, 7x8 and 6x8 ft. Structures are furnished to handle up to 12 panels, with 6-ft ground clearance.
Microflect Co, 2300 S. 25th St, Salem, Oregon

Enlarger Printer

The Copyflo continuous printer is said to produce drawings up to 2-ft wide from microfilm at the rate of 20 fpm. Using xerographic reproduction, the machine requires no



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the key that unlocks the tremendous market potential of the Electric Power Industry . . . whoever you want to reach, no matter which segment of this complex, expanding market they're in. ELECTRICAL WORLD's audience of more than 26,000 *all-paid* subscribers is the bone and marrow of the entire industry—the key people wherever electricity is generated, transmitted, distributed or utilized in large amounts. Want the whole story . . . the real significance of WORLD's audience to you? Simple. Write today for "Quick Facts". . .

ELECTRICAL WORLD
330 W. 42nd St.,
New York 36, N. Y.

ink or liquids and produces completely dry prints. Time for one frame is said to be only a few seconds. Up to 400 prints of a single frame may be had by using repeat exposure feature.
The Haloid Co, Rochester 3, N. Y.

Trickle Charger

This battery trickle charger has a continuous adjustment range of 50 to 200 amp. Output is fused to protect charger components. A meter indicates charging current. With input voltage of 110 to 120 v, 60 cps, output voltages are 12 and 24 v dc. Unit uses full-wave selenium rectifier. Bulletin 236 has more data.
Automatic Switch Co, Florham Park, N. J.

Truck Bodies

Designated as the RD series, service truck bodies for ½ to 1-½ ton chassis are available with body weights from 690 to 1025 lb and cab-to-axle measurements of 38 to 60 in. Rod type hinges, weather sealed doors, and adjustable shelves and trays are standard.

Understructures are 5-in. channel steel with reinforced bridge over wheel housing and 12-gauge diamond plate floor. Models RD1 and RD2 use 16-gauge body steel; RD3 uses 14-gauge. A ¾-ton dual wheel model is also available.
Morysville Body Works, Inc, Boyertown, Pa.

Test Chamber

Here is a salt spray test chamber designed for testing salt fog corrosion resistance of components and materials. Connected to a low pressure air supply, the chamber reportedly produces a fine mist, reaching test conditions in 15 min. Light components are hung from top of chamber, bulkier ones mounted on lucite rods to avoid contact with solution. Chamber and air saturation tower have temperature controllers and indicators. Chamber measures 20x20x20 in.
Associated Testing Laboratories, Caldwell, N. J.

pd offers 5 basic boiler components

P-D makes it easier, safer and quicker when you sign that order for steam generating auxiliary equipment. There's no time delay; no engineering problems; no piece-by-piece delivery from different sources.

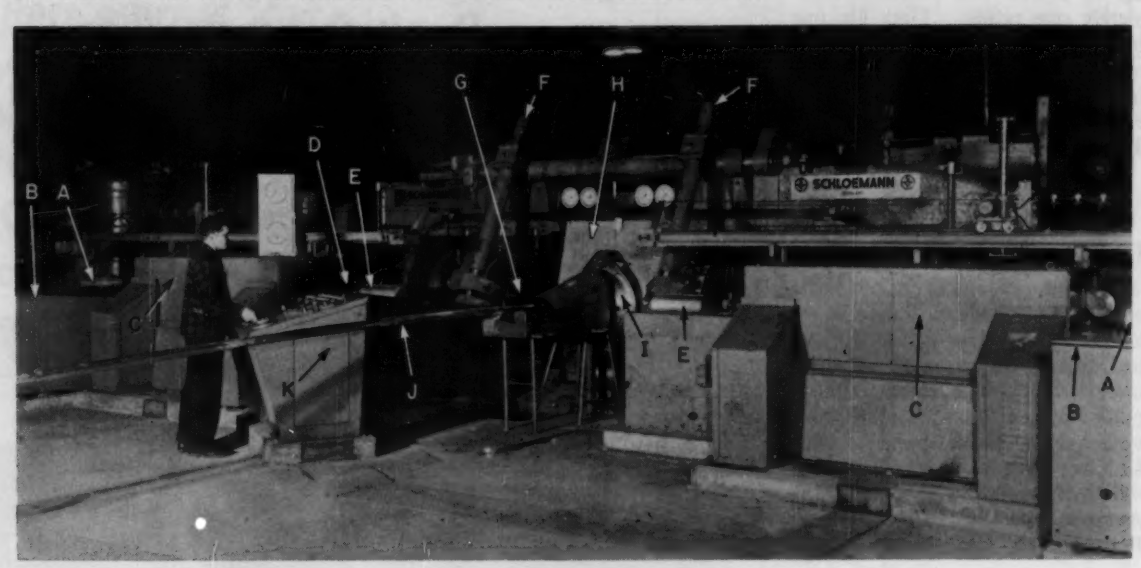
Prat-Daniel's *single responsibility* guarantees equipment of balanced design . . . matched for ease of assembly, unmatched for peak performance. Each component is built to complement the other, with the integrated unit providing highest efficiency for your system.

Prat-Daniel offers years of specialized experience in the design and development of *Forced Draft Fans, Air Preheaters, Tubular Dust Collectors, Induced Draft Fans* and *Fan Stacks* for industry.

Contact The Thermix Corporation, Project Engineers for Prat-Daniel, for your requirements. Ask for data sheets on P-D equipment.

Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 38 Principal Cities)
Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Que.

Designers and Manufacturers
PRAT-DANIEL CORPORATION
SOUTH NORWALK, CONN.
POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks



General Cable Extrudes Al Sheath Directly

Cables having aluminum sheath extruded directly on the core will be marketed shortly by General Cable Co, according to Oscar G. Garner, company vice president. Now sheathed cables are made by the "direct extrusion process" and can be produced in practically any length. The sheathing operation is performed in a press which controls the temper of the aluminum.

The sheathing press has been installed at General Cable's Perth Amboy, N. J., plant. It is reportedly the first direct extrusion aluminum sheathing press installed in the United States, (EW, July 19, 1954, p. 59).

Most interesting developments of this sheathing process, stated Garner, from the cable users' and manufacturers' point of view are:

1. Efficient cooling system to protect the cable insulation while it is in the die block. This feature permits the extrusion at relatively high temperature and low pressures.
2. "Ratchet spanner" arrangement for the control of sheath wall thickness.
3. "Tapered heating" and progressive "upsetting" of billets displacing air from the containers and preventing formation of blisters in the sheath.
4. Synchronization and equalization control of the advance of the rams during the extrusion of aluminum sheath.

Above picture shows the press with significant parts identified. A 1,000 kva substation was installed to supply the two 195-kw induction furnaces, two 45-kw heater units in the die block, and numerous pump and other drive motors.

The extrusion press is a horizontal double piston—double billet unit of 1760 tons capacity. Billets are machined to 7 in. dia and 18 in. long. Weight of two billets per charge is 126 lb. About 3,000 lb of aluminum can be extruded in one hour.

Here's How Press Works

Operation of the press is described briefly from the time two cold aluminum billets are placed simultaneously on separate loading tables until they emerge as extruded sheath on the cable core.

Billets (A) from inclined storage tables when automatically released roll onto transfer trays on the loading tables (B) at each end of the press. From here each billet is passed into a 195-kw induction furnace (C) where it is heated to 500 C. A screw operated pusher (D) ejects the heated billet to a position (E) to be picked up by a loading arm (F). When the arm swings from about a 45-deg loading position to vertical each billet is sprayed (taper cooled) with water to reduce the temperature of the ends facing the extrusion ram to 400 C. Next the extrusion ram (G) forces the billet into the die block assembly (H) at the center of the machine.

The die block assembly consists of the die block, two heated billet containers, and a water cooling system (described later). Also included is an adjustable die holder to regulate the wall thickness of the aluminum sheath. Adjustment of the die holder is controlled by a ratchet spanner (I) hydraulicly operated. The die block and extrusion tools are similar to those used in the conventional lead sheathing press.

Cable core from a reel at the rear of the machine, enters the die block where aluminum at 4,600 psi is extruded. A water cooling device at the entrance side of the die block protects the cable insulation from the high temperatures in the die assembly.

On the cable exit side of the die block a second water cooling device cools the sheath and protects the cable core as the extruded aluminum sheathed cable (J) emerges.

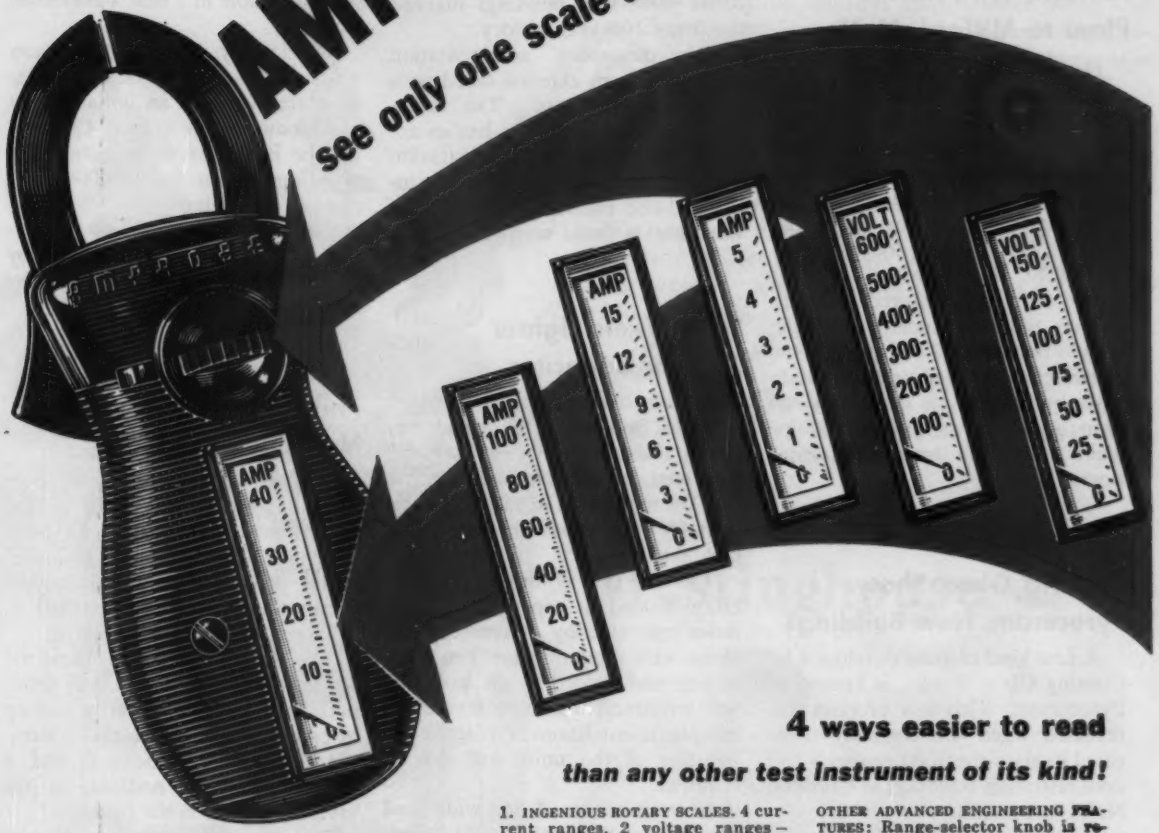
The master control desk (K) is

(*Continued on page* 94)

More features at your call at the lowest price of all

AMPROBE RS-1 only $39.85

see only one scale at a time!



RS-1 — the volt-ammeter with the most-used ranges

There's one for every job and every budget.

The new RS-1 is one of the 14 AMPROBE models priced from $19.85 to $67.50.

• ®

4 ways easier to read

than any other test instrument of its kind!

1. INGENIOUS ROTARY SCALES. 4 current ranges, 2 voltage ranges — each on a scale of its own!

2. ONE HAND OPERATION! Range selector knob is next to your thumb.

3. NEW MAGNIFIED DIAL . . . LONGER SCALE LENGTH. Greater visibility, greater accuracy, than ever before.

4. POINTER-LOCK "FREEZES" POINTER AT READING. Use the RS-1 any place your hand can reach. Needle can be locked in place so that you may read it away from conductor.

OTHER ADVANCED ENGINEERING FEATURES: Range-selector knob is recessed so that it can't be moved accidentally. Simple bayonet leads lock in at bottom for quick connecting. Impact-proof case with non-slip ribbing. Advance printed circuit construction. Shielded core magnetic movement. Leather carrying case can be worn on your belt.

Amprobe, a division of Pyramid Instrument Corp., Lynbrook, New York, manufacturers of famous REMCON simplified low-voltage Hi-Fashion switching devices.

don't guess at it; AMPROBE IT!

General Cable Extrudes

(*Continued from page* 92)

equipped to operate the press and auxiliary heating and pumping equipment.

A take-up stand, accommodating large diameter reels, is mounted at the cable exit side of the extrusion press. Its position is adjustable for a distance of 20 to 70 ft from the press.

Hendrix Wire Moves Plant to Milford, N. H.

Hendrix Wire & Cable Corp moved into its new plant at Milford, N. H., early this month, to accommodate increasing business. This manufacturer specializes in high voltage aerial cable up to 22-kv rating and in packaging clamp designs. It was formerly located at 15 Watson St, Boston, Mass.

The company acquired a 7-acre site on which is located a single story structure 220 ft by 80 ft for manufacturing space, and a separate office building. New machinery has been added to supplement equipment transferred from the former Boston plant.

Corning Glass Shows Pyroceram, New Buildings

A new kind of glass developed by Corning Glass Works, is known as Pyroceram. This new product was revealed when the company dedicated its glass-sheathed research and administration buildings at Corning, N. Y. last month.

Dr. William H. Armistead, vice president and director of the Research and Development Division, pointed out some of the outstanding characteristics of Pyroceram. These are: Harder than high carbon steel, lighter than aluminum, and nine times stronger than plate glass.

Armistead stated that this glass can be tailor-made with thermal expansions ranging from slightly negative to high enough to match those of heavy metals. It can have electrical insulating properties superior to those of commercial dielectric ceramics. It can be made opaque or transparent. Certain types keep their strength at temperatures up to 1300 F. Softening point is 2460 F. Flexural strengths are as high as 60,000 psi.

First commercial use of this nonporous crystalline material will be for a guided missile radome. Although in the pilot-plant stage, other uses envisioned are: Conductive heating plates for tops of electric ranges, cooking ware, heating panels, corrosive resistant devices for chemistry and oil industries, and curtains and walls for buildings.

Corning Glass Work's dedication of its three new buildings marked the firms 106-year history.

The nine-story administration building has an exterior faced with block Carrara glass. The three-story research laboratory has an exterior matching the administration building with heat-reflecting windows. The one-story development workshop is faced with glass brick.

GE Markets Lighter 25 Kvar Capacitor

A 25-kvar capacitor, 25% lighter in weight and with a fabricated corrosion resistant steel case, is being marketed by the General Electric Co. The new unit, GE says, is lighter than any other capacitor of its rating now available.

The new case is formed and precision-welded at top, bottom, and down one side by automated machine with mounting brackets projecting and welded to the case. It will withstand the most severe atmospheric conditions. Protective repainting of the units will not be required.

New units are 4 in. wide and over-all height is 20.5 to 21.75 in. high. Weight ranges from 49 to 52 lb depending on voltage ratings. They are available in ratings from 2,400 to 13,800 v.

Gulton's Marketing Plan

Gulton Industries, Inc, Metuchen, N. J., has a new approach to marketing its ultrasonic system and equipment. An outright purchase would cost about $3,000. On a rental plan it would be available, said Dr. L. K. Gulton, president, for $250 monthly, including maintenance, parts repair, lifetime guarantee, and a service contract. An example is the Glennite industrial small parts cleaner, console model.

Phelps Dodge Affiliate Makes Wire in Venezuela

Caracas—(McGraw-Hill World News)—Alambres y Calbes Venezolanos, C. A., an affiliate of Phelps Dodge Copper Products Corp, has started manufacturing electrical wire and cable in a new Venezuelan plant.

The factory, located in Maracay west of Caracas, is producing plastic-coated wires in an initial output of 150 meters per minute. Capacity will be increased when installation of equipment in the 155,000-sq ft plant is completed.

Capital of the company is $1,050,000, two-thirds subscribed by local investors and one-third by Phelps Dodge.

Philco Corp Reveals New Sales Financing

An over-all sales financing program has been inaugurated by the Government & Industrial Division of Philco Corp. This "true-lease" rental plan for Philco's industrial clients was revealed by Marshall A. Williams, general sales manager.

The plan is designed to extend the service and use of many G&I products. And, funds ordinarily tied up in capital assets are released, earning capacity is increased, and a greater return is realized on the invested capital in the business.

Philco products to be leased under this plan include Transac—the completely transitorized large scale electronic data processing systems, microwave communications systems, closed circuit television, Exicon—new color X-ray viewing contrastor, television broadcasting equipment and other equipment.

Term of leases are from one to five years. After expiration of the basic term, the Lessee may continue to have unrestricted use of the equipment by taking options for a series of year-to-year leases, at sharply reduced yearly rentals.

1612 years of fail-free service prove...

COMPLETE THREE-POLE PROTECTION IN ONE TANK

One answer to rising maintenance costs is the Westinghouse single-tank Type G breaker. More efficient use of oil, reduced maintenance hours and small space requirements add up to major maintenance savings. There are only two adjustments—mechanism stop and travel stop.

1612 breaker-years of service without failure assure this economy without compromise on protection.

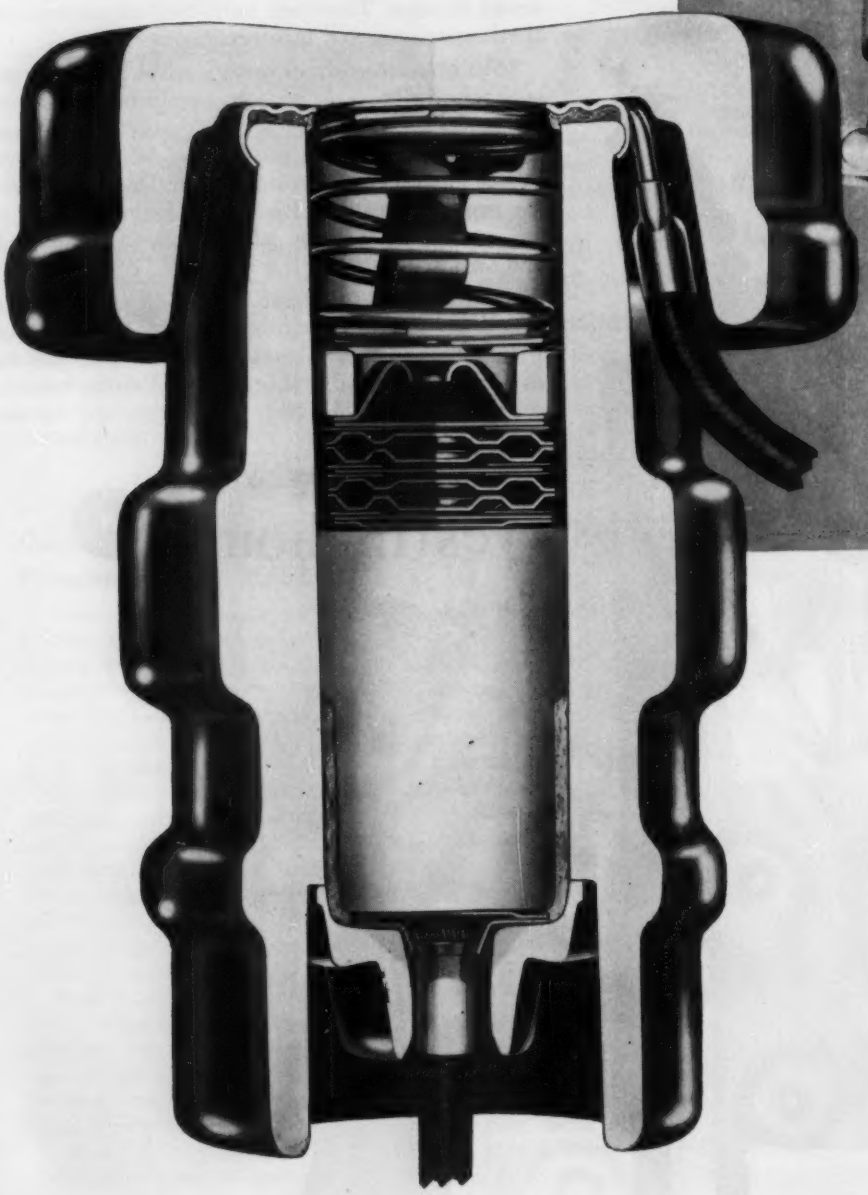
The Westinghouse single-tank Type G breaker has a single De-ion® grid per phase—with exclusive Westinghouse design to shorten arc length and arcing time. Interrupting time is five cycles. Interrupting capacity is 100 or 250 mva at 14.4 kv—and 250 mva at 23 kv.

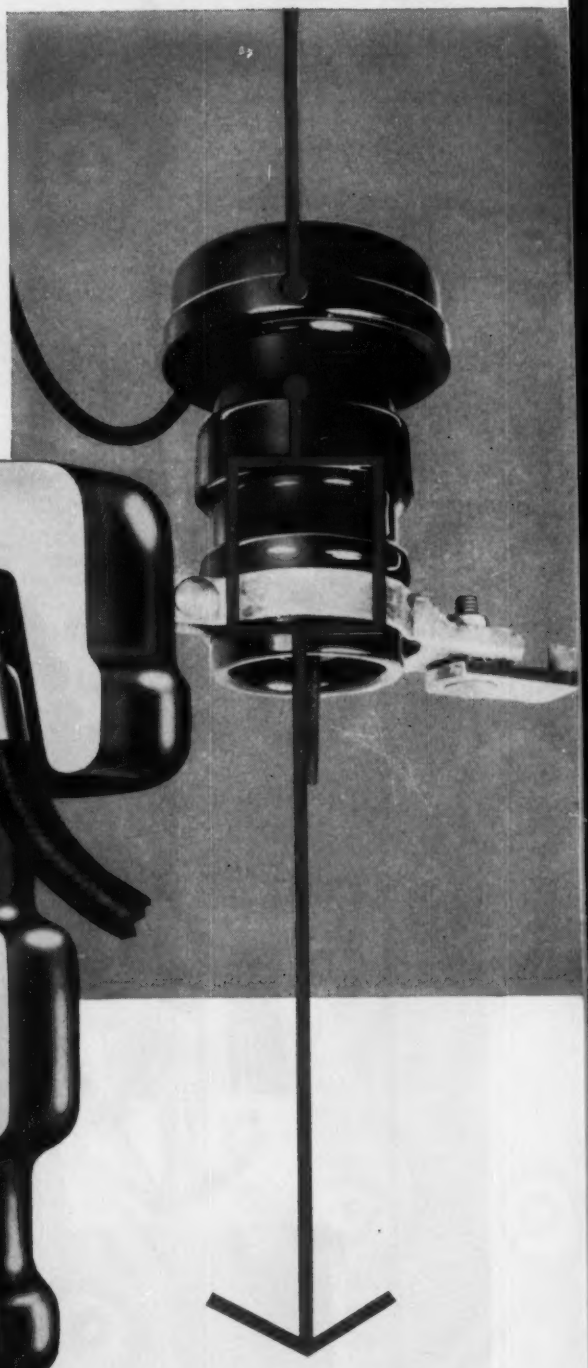
Complete details are available from your Westinghouse sales representative—or you may write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania, requesting booklet B-5834. J-60927

YOU CAN BE SURE...IF IT'S

Westinghouse

LV arrester... simple dependable





LIFE
IS IN THE BALANCE

Optimum balance between electrical characteristics and arrester life results in the best arrester.

Westinghouse LV valve arresters achieve this balanced performance . . . protection without needless operation . . . long life without courting trouble . . . the highest order of moisture protection eliminating radio and TV interference.

The integrity of the LV design has been proved by 17 years of trouble-free field service—another reason why you should specify Westinghouse LV arresters.

Complete information is available from your Westinghouse sales representative. Or write for Descriptive Bulletin 38-140. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60925

YOU CAN BE SURE... IF IT'S Westinghouse

Your Westinghouse representative can prove . . .

NEW TD INDICATOR SIMPLIFIES TRANSFORMER LOAD MANAGEMENT

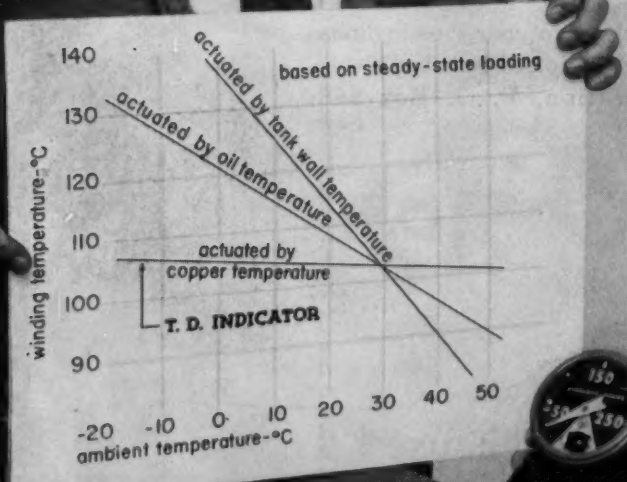
The new thermal duty indicator records total overload hours cumulatively —simplifies overload monitoring. Because it is actuated by copper temperature, you can use the full capacity of transformers. Here is a new tool for effective load management of pole-type transformers.

J-70793

YOU CAN BE SURE...IF IT'S

Westinghouse

Kent Walker, manager of Distribution, South Carolina Electric and Gas Company, and Ken Leland, Westinghouse Representative.



ELECTRICAL BUSINESS OUTLOOK

Electrical World
JUNE 17, 1957

There is still enough zip in the boom to keep government officials worried about inflation. The latest word from Washington seems to be that there will be no significant changes in tax or credit policy in 1957. The Federal Reserve will probably sit tight and keep money that way. Congress has pretty much ruled out a tax cut until federal spending shows signs of leveling off.

Meanwhile the Treasury continues to have its own cost of living headaches. Borrowing costs on three-month bills hit 3.374% recently—the highest rate since the bank holidays of 1933. Just goes to show that the cost of managing the debt is going up and up like everything else.

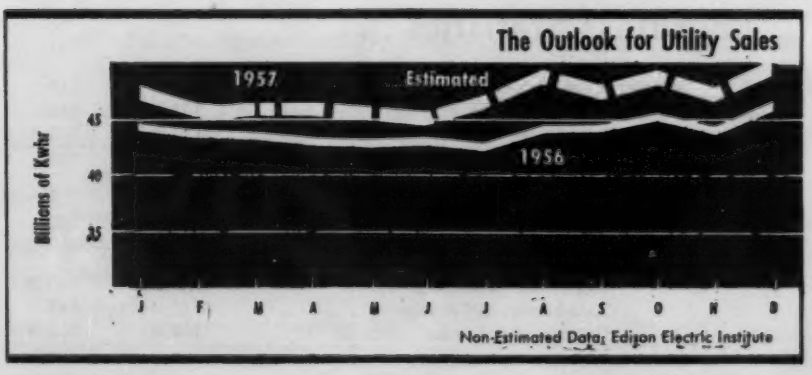
Prices will continue to creep in the next few months. E. Clague, head of Bureau of Labor Statistics, has already predicted a rise in the consumer price index for May and June. In April, the index stood at 119.3, up almost 4% from a year ago and the eighth consecutive monthly rise.

But over the longer run, inflationary pressures should definitely ease. Thanks to so much new plant and equipment, manufacturers are now operating at about 83% of capacity. Employment isn't busting at the seams. Competition is rugged. Put these all together and it's a fairly safe bet that inflation will not pick up momentum in 1957—even with an upturn in business later on this year. It's just that a budget surplus (we hope) and tight money are being thrown in for extra good measure.

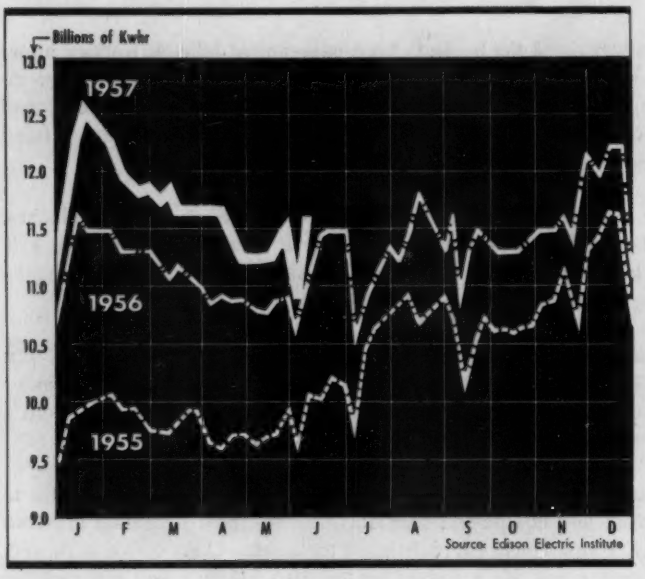
Tight money problem will continue to plague electric utilities. Looking at EEI's power survey, for example, you see continued record-breaking financial outlays in the offing for generating equipment. Scheduled shipments next year for both thermal and hydraulic capacity is 16.4 million kw. Other equipment areas are up also, as you'll see in a coming Manufacturers & Markets report.

A slight dip in interest rates may come this summer, however, as savings take an upturn. Generally, though, money rates will stay around present yields. Recent offering of Boston Edison Aaa bonds, for instance, was priced to yield 4.53%.

The 50-50 ratio on financing the industry's booming expansion program will likely continue during tight money days. Half of the funds will be secured outside utilities in securities; the other half will be channeled from internal earnings, depreciation, and bank loans.



STATISTICS



OUTPUT

Week ended June 8, 11,550,000,000 Kwhr Up 5.5%

Per Cent Change From Previous Year

	May 25	June 1	June 8
Total U. S.	+ 5.9	+3.4	+ 5.5
New Eng.	+ 6.5	+2.6	+ 3.9
Mid. Atlan.	+ 5.6	+1.5	+ 3.5
Cent. Ind.	+ 5.6	+1.8	+ 4.4
West Cent.	+ 5.3	+3.4	+ 6.5
Southeast	+ 7.9	+6.0	+ 8.9
South Cent.	+ 4.9	+0.4	+ 1.5
Rocky Mount.	— 0.4	—0.6	+ 3.3
Pacific			
NW	+10.6	+5.7	+ 3.7
SW	+ 2.9	+6.1	+10.2

Seasonally Adjusted Index 226.6
Week Ago 227.8
Year Ago 214.4

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 5.8%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	million kw	Mar.	121.78	121.33	116.56	4.5
Peak—Class 1 Systems	million kw	Mar.	98.0	98.8	92.7	5.7
Estimated Dec. '57 Peak	million kw	Mar.	113.5	113.5	114.1	— 0.5
Production—billion kwhr		Mar.	52.45	48.67	50.34	4.2
Hydro			11.44	9.98	11.78	— 2.9
Fuel			41.01	38.69	38.56	6.4
Sales—billion kwhr		Mar.	47.75	47.78	45.36	5.3
Residential			13.47	14.25	12.46	8.1
Commercial			7.35	7.49	6.84	7.5
Industrial			24.44	23.65	23.70	3.1
Other			2.49	2.40	2.35	6.0
Fuel Consumption		Mar.				
Coal—million tons			13.84	13.21	13.39	3.4
Oil—million barrels			6.57	6.96	6.22	5.6
Gas—billion cu ft			93.15	83.24	85.17	9.4
Net Income Class A & B Co's—$ million		Mar.	126.81	142.34	116.86	8.5
Residential Customers—millions		12 mos.	45.99	45.92	44.67	3.0
Revenue per kwhr		ended	2.59¢	2.59¢	2.63¢	— 1.5
Avg. kwhr per customer		Mar. 31	3,021	3,004	2,820	7.1
Avg annual bill			$78.23	$77.80	$74.17	5.5

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production		April	146	148	144	1.4
ENR Construction Cost		June	151.2	150	145.1	4.2
BLS Cost-of-living		April	119.3	118.9	114.9	3.8
New Orders for Machinery (1950 = 100)		April	147	159	149	— 1.3
NEMA Sales						
Insulation materials		April	145	153	163	—11.0
Electric appliances			83	97	111	—25.2
Wholesale prices		Mar.				
Motors and generators			140.7	140.2	126.9	10.9
Transformers and regulators			147.4	146.6	133.1	10.7
Switchgear and fuses			164.4	164.4	147.8	11.2
GNP—annual rate—$ billion		1st Qtr.	427.0	423.8	403.4	5.9%

MANAGEMENT BULLETIN

FINANCE

Only one bond issue was offered last week. This was the $19 million Metropolitan Edison Co first mtg 4⅞% bonds (Aa) being sold by a group headed by Halsey, Stuart & Co at 101.50% to yield 4.78%. Bonds are "going slow", the underwriters reported as EW went to press. Earlier the group had won the bonds with a bid of 100.57%.

"All sold" was the comment by Halsey, Stuart & Co after it offered $15.5 million Georgia Power Co first mtg 5¼% bonds (A) due 1987 at 102.29% to yield 5.10%. Earlier Halsey had won them with a bid of 101.48%.

REA makes loan policy changes. On any loans made hereafter interest of 2% (fixed by Rural Electrification Act) will be payable on a quarterly basis as it accrues. In the past, payment of interest was postponed during the early period of the loan. Accrued interest during that period was paid in installments over the remaining life of the loan. Borrowers will now be able to make interest payments from loan funds.

Security postponements: Tampa Electric Co delays sale of 217,286 common shares and $18 million first mtg bonds scheduled for July. Reason: Possible change in its 1957 financing program. . . Because of market conditions Southern California Edison Co has decided not to sell 1.3 million shares of preferred. Instead company will sell $40 million bond issue competitively on July 1.

Budget billing is being offered by Washington Water Power Co. Plan enables homeowners who heat with electricity to pay a specified amount each month, spreading the cost of high-use months to other parts of the year. Thus the customer sets up a credit amount with WWP when his useage is low and this credit is used up as monthly electric consumption increases.

Montana Power Co asks OK on stock sales. Company will present for shareholder approval at the annual meeting in Butte on June 19 a plan to sell 100,000 common shares to Montana residents.

New England Electric System's offer to exchange two shares of its common stock for each share of Lynn Gas & Electric Co stock has been accepted by 75.1% of the outstanding Lynn shares. NEES's Pres Irwin L. Moore has filed with the SEC a request for a 30-day extension of the exchange offer from May 29 through June 28 for the convenience of Lynn shareholders.

LEGISLATION

Maine: A bill removing "current value" or reproduction cost as one of the factors the Public Utilities Commission must consider in evaluating the properties of public utilities for rate-making purposes was given final passage by the Maine legislature and sent to the governor for signature.

North Carolina: Legislature has passed a bill which will permit electric companies to exercise the right of eminent domain to acquire rights-of-way needed for "coal pipelines." Power companies said they needed the law to permit them to offset rising freight rates on coal. Railroads opposed the bill.

A labor union cannot be sued. So ruled the Canadian Supreme Court which may have a far-reaching effect in the labor field. A union as such does not have "contractual capacity", so cannot incur "liabilities in tort", the court said. The ruling modified a $5,000 judgment made by a Manitoba court against Winnipeg local of the teamster's union, its present executives, and the union leaders who were involved in the 1947 dispute from which the suit stems. It said only the union leaders whose acts led to the suit should have to pay.

Level of wages is more the consequence than the cause of changes in the supply of money, W. C. Mullendore, chairman, Southern California Edison Co, points

out in an article "Do Wage Hikes Cause Inflation?" in the June issue of "The Freeman". For copy write The Foundation for Economic Education, Inc, Irvington-on-Hudson, New York; price 50¢ a copy.

AREA DEVELOPMENT

Cleveland Electric Illuminating Co's service area is destined by favorable factors to grow economically at a faster rate than any other portion of the U. S. This is a statement made by company's Vice Pres Robert C. Heinton recently. With the completion of St. Lawrence Seaway in the next two years, these were his reasons: Deep water shipping; four great ports, Conneaut, Ashtabula, Fairport, and Cleveland; unlimited fresh water; a number of main line railroads; truck transportation and road facilities; diversity of industry; and a fast-growing research industry.

TAXES

Oregon's Northern Wasco County PUD pays back taxes. After the Oregon supreme court refused earlier this year to rehear the PUD's appeal against validity of taxes, PUD pays $42,928.08 to Wasco County as back taxes. PUD Manager Erick Johnson said the PUD board declined to pay taxes assessed against its properties on ground the district was not legally subject to property tax. Supreme Court held last January that the taxes were levied legally. PUD has paid franchise tax payments to the city of Dalles where its lines compete with those of Pacific Power & Light Co.

In probe of tax-draining exemptions, Arizona's House Tax Study committee rejects proposal to tax Salt River Power District in the same manner as private utility companies.

A district court hearing has been set for June 19 on an injunction suit brought by 13 Wyoming communities to prevent the state board of equalization from taxing their municipally-owned electric plants. Earlier Wyoming attorney general's office ruled that city-owned electric plants were not "governmental functions" and should be subject to state property taxes.

A bill calling for a constitutional amendment to permit taxing the power districts on the same basis as private businesses has been turned down by the Nebraska legislature judiciary committee.

RATES

"Fuel cost adjustments are not compensatory for steam heating service expense today in the face of increased costs of plant additions and replacements, labor, and other expenses." This statement was made recently by Clifford O. Thurlow, rate consultant on the staff of Commonwealth Services, Inc, and chairman of the Rates and Regulations Committee of the National District Heating Association, at its annual meeting in Hot Springs, Ark. While Thurlow's report refers to steam heating service, it could well be considered by the electric utility industry because of certain parallels.

Rising fuel costs may force Tampa Electric Co to up rates. This statement was made recently by company's Pres William C. MacInnes. He said the company was faced with a $200,000 burden brought on by a disputed contract with a Kentucky coal producer. He explained that the company was forced to buy from others under "spot purchasing (which) costs nearly double that which you secure by contract."

ADVERTISING

Eyecatcher Ads: "Did You Know That—Your Electric Rate is Far Lower Than Almost Anyone's!"—Southern Nevada Power Co . . . "Thanks Folks . . . **Yes** Thanks a Lot . . . for your patient and friendly attitude during the past two days while we were restoring electric service interrupted in many parts of the city by Thursday's wind and rain storm"—Dallas Power & Light Co.

STRAIN + TIME = WHAT?

Time-Loading Test Confirms Stable Strength of the Porcelain in O-B Insulators

Is the strength of porcelain *always* the same? That's what we are finding out in this test. Is porcelain stronger under a quickly-applied load than under a long-sustained one? Obviously, this could mean a lot to the man using strain insulators.

So far, it has been largely a matter of opinion (nothing can happen to porcelain!) But our ceramic research men take the attitude that something is liable to happen to anything. Hence, this painstaking, time-consuming, hair-splitting series of time-loading tests.

Porcelain, under a sustained load, does have lower strength, as do most other solid materials. But the difference is hardly measurable. It is completely smothered under safety factors.

-- So, it looks like a lot of wasted time; like an anti-climax, but it's just as important as a major discovery. There was an un-answered question. We ran it down. And we are glad it turned out as we expected.

Someday you may have some question about your insulators. Consider the value of doing business with a company that digs deep to provide competent answers. This is one of the unseen things in the package that gives you more for your money when you specify O-B insulation.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

TECHNICAL COMPETENCE

Ohio Brass

4818-H

THE HEART OF EVERY (B) INSULATOR

Lighting the way to better insulator performance

Flame Photometer provides quick, accurate analysis of soluble alkalies in clay, feldspar

Clays and feldspar often contain seemingly insignificant amounts of alkalies and alkaline earth metals. But even a small amount, less than one per cent, can affect pH factor and viscosity of the porcelain body and glaze. It also affects preparation, workability and fusion range of the body . . . all of which are reflected in the finished insulator unless we discover the alkali and compensate for it.

Consequently, a battery of instruments and laboratory techniques are used to find out just what's in the raw materials. One of the most useful instruments is the flame photometer.

Whereas a wet chemical analysis takes days, the photometer identifies the alkalies in a few seconds. As a result, we have close control over the porcelain mix and glaze, and close control over the quality of the finished insulator. What's revealed in the flame of the photometer has a direct connection with the way O-B insulators perform on your lines.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4743-H

MEETINGS CALENDAR

JUNE

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Canadian Electrical Association—Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

Public Utilities Association of the Virginias—Sales and Publicity Committee, Charlottesville, Va., June 20-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Institute of Electrical Engineers—Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

Electric Companies Public Information Program—West North Central Regional Group, Fort Des Moines, Des Moines, Iowa, June 25.

American Public Power Association—Hotel Biltmore, New York City, June 25-27.

National Machine Accountants Association—6th Annual Conference, Conrad Hilton Hotel, Chicago, Ill., June 26-28.

JULY

Southeastern Electric Exchange—Personnel Administration Section Conference, John Marshall Hotel, Richmond, Va., July 25-26.

AUGUST

Western Electronic Show and Convention—Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

American Institute of Electrical Engineers—Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Edison Electric Institute—Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Public Utilities Association of the Virginias—39th Annual Meeting, Green-Brier Hotel, White Sulphur Springs, West Virginia, Sept. 20-21.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

Electric Companies Advertising Program—Copy Group Meeting, Detroit, Mich., Sept. 25.

Electric Companies Public Information Program—Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

OCTOBER

Pennsylvania Electric Association — 50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

International Association of Electrical Leagues—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Industrial Conference Board—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

American Society of Mechanical Engineers—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, Americus Hotel, Allentown, Pa., Oct. 21-23.

National Electronics Conference, Inc—Hotel Sherman, Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Illinois, October 7-11.

Edison Electric Institute—Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 10-11; Transmission & Distribution Committee, Statler Hotel, Boston, Massachusetts, October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Va., Oct. 23-24.

Interstate Power Club—Hotel Martinique, New York City, N. Y., October 14.

• **Wisconsin Utilities Association**—Electric & Gas Operating and Sales Sections, Schroeder Hotel, Milwaukee, Wis., Oct. 16-18.

Atomic Industrial Forum—Annual Conference, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

National Association of Railroad Utilities Commissioners—Annual Convention, Peabody Hotel, Memphis, Tennessee, October 28-31.

Industrial Management Society—21st Anniversary Industrial and Management Clinic, Hotel Sherman, Chicago, Ill., Oct. 30-Nov. 1.

Institute of Radio Engineers—3rd Annual Technical Confere of the Professional Group on Electron Devices, Shoreham Washington, D. C., Oct. 31- Nov. 1.

• Additions this week.

G. R. Armstrong Heads LG&E

George R. Armstrong, executive vice president of Louisville Gas & Electric Co since 1948, has been elected president at a special meeting of the board of directors. His appointment filled a vacancy created by the recent death of T. Bert Wilson.

The new president began his utility career in 1922 in LG&E's special construction department while teaching mathematics at Louisville Male High School. His elevation to superintendent of construction in 1929 was followed ten years later by his promotion to assistant general superintendent. He rose from that post to general superintendent of the operating department within a year. Armstrong, a Rose Polytechnic Institute graduate, has been a director since 1946.

Wilson, 80, had been connected with LG&E and its predecessors for more than 60 years and had served as president for the past 26 years.

GEORGE R. ARMSTRONG

C. R. STOCKHUS

ANDREW J. HASWELL

ROBERT H. ENGELS

Three Utilities Appoint New Vice Presidents

Newly elected vice president of Union Electric Co is C. R. Stockhus. He will continue in his former capacity of director of labor relations, a post he has held since 1954.

Stockhus has been employed by Union Electric since 1931, when he was graduated with an electrical engineering degree from Washington University. For nearly 20 years he has been engaged in personnel work.

An industry member of the Missouri State Board of Mediation since 1955, Stockhus has also been active on several committees of Edison Electric Institute.

Oklahoma Gas & Electric Co has named as a vice president Andrew J. Haswell, director of personnel administration since 1946.

Under his leadership OG&E developed a training and safety program which led to the utility's third place rank in accident prevention among all utilities of its size.

Haswell, once a part-time mail boy while attending high school and Oklahoma University, has been a full-time employee since receiving his B. S. degree in 1929. Since then he has been Western Division accountant and assistant auditor.

Robert H. Engels has been elected a vice president of Northern States Power Co. He has been assistant to Pres Allen S. King for the past year, and will continue in that capacity.

Engels has devoted most of his 31-year NSP career to the sales field. Starting in 1926 as a merchandise salesman, he rose to sales manager of the Galena Division in 1934, and transferred to the general office municipal sales department in 1948. He was appointed Sioux Falls Division manager in 1952 and assumed his position as assistant to King last January.

ALL HE'S CHECKING IS WHAT'S ON THE REELS —NOT THE REELS THEMSELVES. These convenient one-way reels are now available with Rome's building wire, Triplex SD, and line wire.

There's no need to keep track of these one-way reels . . . they're non-returnable

Now available in all bldg. wire through 500 MCM, Triplex SD, and line wire

The non-returnable reel—first adopted as a standard by Rome Cable—gets rid of many of your recording, reshipping, and inventory headaches. Here are some of the ways it benefits you:

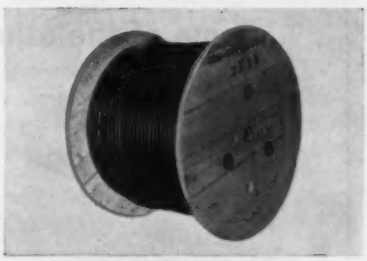
Eliminates bookkeeping costs. You avoid the extra paper work brought on by billing, crediting, and storing of returnable reels.

Saves storage space. When the wire or cable is used up, you simply destroy the reel or throw it away.

Handles easier. Rome's non-returnable reel is lighter to handle than an ordinary reel—yet sturdy and quite adequate for normal service.

All these benefits are now available to you with all Rome's building wire through 500MCM, Triplex service drop cable, and line wire.

Be sure to consider the advantages of Rome's standard non-returnable reel package when you place your next wire or cable order. Contact your nearest Rome Cable representative for more information—or write to Dept. 139, Rome Cable Corporation, Rome, N. Y.



ROME CABLE

CORPORATION

Easier to Handle. The lightweight construction of Rome's aluminum Triplex makes it easier to handle and quicker to install than open-wire drops.

Neater Appearance. This self-supporting service drop cable offers neat appearance of a single cable assembly compared to open wires.

Rome's lightweight aluminum Triplex goes up

Some of the other benefits provided by this service cable

The construction features of Rome's aluminum Triplex lead to still more savings:

Costs less. Initial cost is lower than conventional copper Type SD service drop cable.

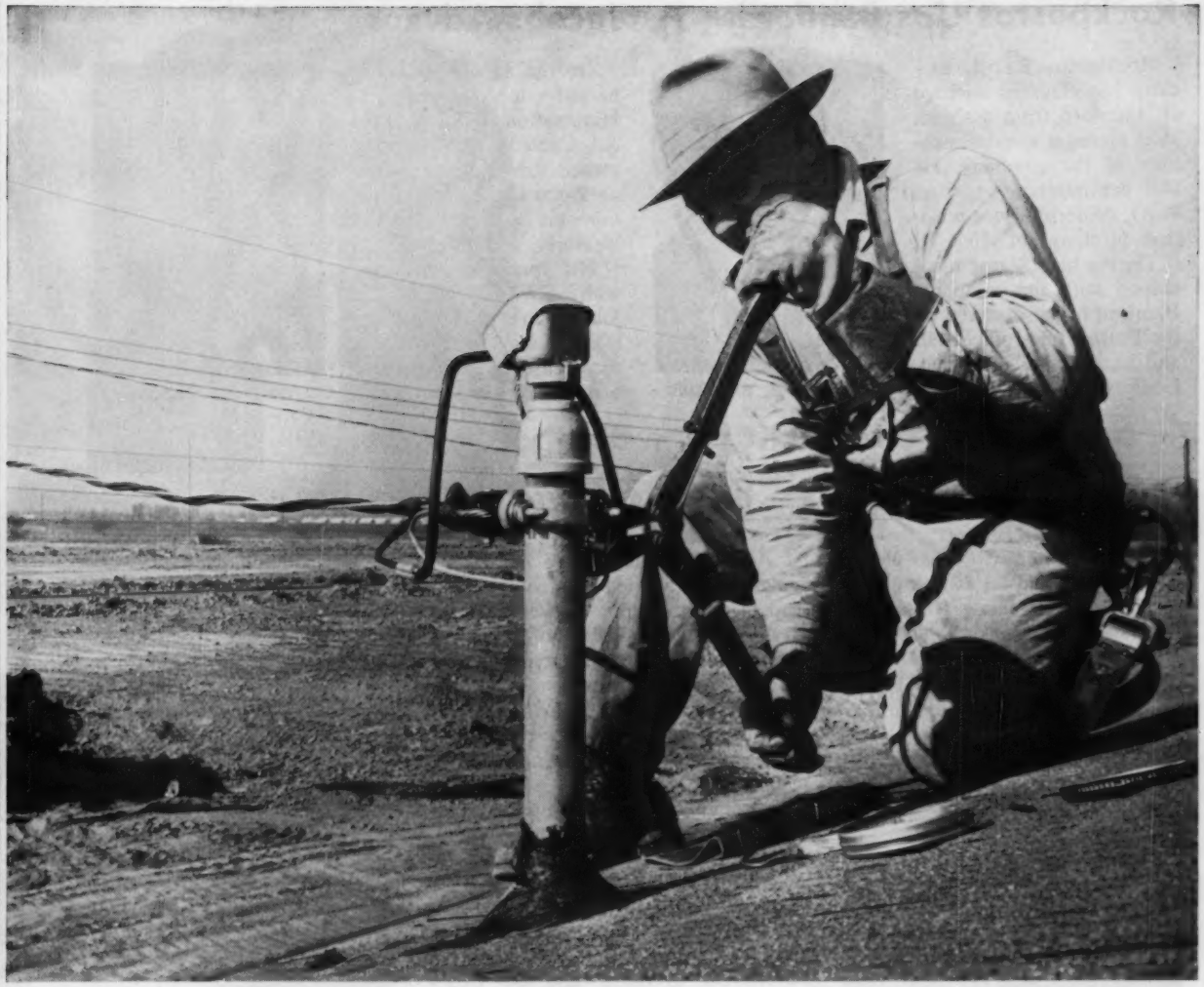
Lasts longer. Maintenance and service interruptions are few compared to open-wire installations. It offers maximum resistance to storms, wind, and ice loading.

Fewer poles required. Fewer poles are required and longer spans are possible with mid-span taps on secondary Triplex.

Less hardware needed. Service tap connections at the pole require less hardware than a conventional three-wire tap.

You have a choice of Roprene (neoprene) or Rolene (polyethylene) insulation. Either one withstands the severe effects of sunlight, heat, moisture, corrosive atmosphere, and other common hazards.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information —or write to Department 366-A.



much faster than open-wire service drops

That means real savings in on-the-job manpower costs

Reduce your service-drop installation time—even by a few minutes—and you save money. Now it's possible to speed up practically every job.

High dollar savings. Rome's aluminum Triplex can be installed much faster than open-wire service drops. Multiply the time it saves by the high cost of keeping your crew on the job, and you'll see how great the savings are in manpower costs alone.

Why such savings are possible. The lightweight construction of Rome's aluminum Triplex is behind these important savings. This single cable assemby weighs less than conventional copper three-wire service drops, so it's easier to handle and quicker to install.

Rome's aluminum Triplex offers simplicity in construction. A self-supporting cable, it consists of specially insulated power conductors spiralled around a "straight-away" neutral conductor. Less handling is required to pull it off the truck, string it, and connect it than conventional three-wire service drops.

You can purchase this economical service drop cable in handy 500-foot cartons, paper-wrapped coils, or on non-returnable reels.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 366-A and ask for Bulletin RS-5. Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

Rockbestos Ups Bamford

Rockbestos Products Corp has elevated Richard H. Bamford from assistant sales manager to sales manager of the company. He will continue to report to H. O. Anderson, vice president in charge of sales.

During his 18-year association with the company, Bamford has also served on the Detroit sales office staff and as manager of the St. Louis sales office.

RICHARD H. BAMFORD

Jacobs Advances to VP

George Jacobs is newly named vice president-administration of Circle Wire & Cable Corp, wholly owned subsidiary of Cerro de Pasco Corp. He will retain his post of CW&C treasurer and director.

His previous positions with CW&C, which he joined in 1933, include office manager, assistant to the treasurer, and general manager of the company.

GEORGE JACOBS

PERSONAL BRIEFS

Montana Power Co has elected **Harry C. Donaldson** as treasurer to succeed the late **James R. Sullivan.** Donaldson is former assistant secretary and assistant treasurer.

McGraw Medal Awarded

Lester E. Barrett has been chosen 1957 recipient of the James H. McGraw Distributors Award for Electrical Men. Barrett is immediate past president of National Assn of Electrical Distributors and president of Barrett Electrical Supply Co.

The award, presented to the most outstanding individual contribution of merit in the distributing branch of the electrical industry, cited Barrett because "It was mainly through his initiative that the Adequate Wiring Committee was organized within NAED."

At Arizona Public Service Co **Ed Lodge** was promoted from superintendent of the Saguaro power plant to general superintendent of power production with direct responsibility for operation and maintenance of all the utility's power plants. **Ed Huskison** becomes superintendent of power supply and scheduling. Replacing Lodge at Saguaro is **Elmer Dowies.** Others advanced were **Hugh Cocklin,** to Saguaro plant engineer, and **Fred Wilgus,** to plant results engineer.

Marvin Murphy is new manager of Southwestern Gas & Electric Co's Fayetteville Division and **S. C. Smith** has been made distribution engineer at Fayetteville.

Pennsylvania Power & Light Co has as its new safety engineer **George E. Williams,** former assistant division superintendent at Wilkes-Barre. He succeeds **Edward A. Hagenbuch** who has been appointed superintendent of tests.

Donald L. Jordin has been named farm sales supervisor of Washington Water Power Co. **Rich Bakes,** who formerly held the post, has been named Spokane Division plant engineer.

In recent promotions, Georgia Power Co named **Lee O. Martin** chief division operation at Valdosta Division, **Charles B. Rogers** district superintendent at Valdosta, and **Clifford B. McManus** district superintendent in Albany.

Henry Hupp has advanced from residential representative to residential supervisor of Monongahela Power Co's Fairmont Division.

Alabama Power Co has named **W. R. Patrick** Southeast Division service superintendent . . . Arkansas Power & Light Co's **Bill E. Corn** has been advanced to sales manager in the Northeast district.

R. E. Shillady, general purchasing agent of the New England Electric System, has been elected president of the National Association of Purchasing Agents for the year 1957-58.

Morris D. Hooven, chief electrical engineer of Public Service Electric & Gas Co and immediate past president of American Institute of Electrical Engineers, recently received the honorary degree of Doctor of Science at Newark College of Engineering.

Newly elected director of Boston Edison Co is **Thomas H. Carens,** who will continue as vice president in charge of public relations.

Herbert J. Scholz has retired from active service as chairman of the board of Southern Services, Inc, the mutual service company of the Southern Co system. He will remain with the Southern Co as an independent consultant on a part-time basis and will represent the company and its affiliates in their deal-

(*Continued on page* 112)

How to improve heat-rate of Station "A"?

ASSUMING LOADS AND PEAKS are increasing or that the boiler will soon be derated . . .

An improvement of 5 to 6% in the over-all heat rate might very easily be accomplished by combining a Westinghouse gas turbine-generator with an existing steam turbine-generator, using the gas turbine exhaust for:

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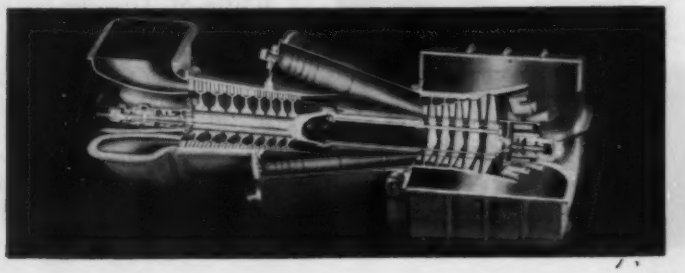
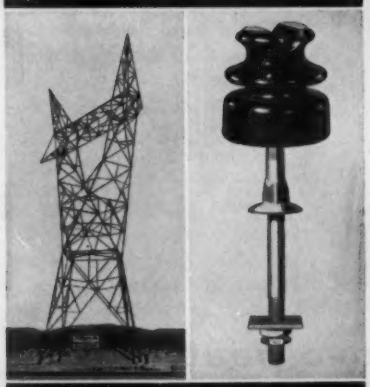
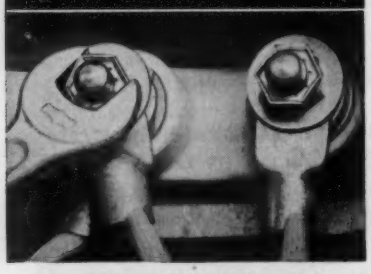


Assemblies stay tight!



Connections stay tight!



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for quick, secure fastening at low cost

Personal Briefs

(*Continued from page* 110)

ings with Atomic Power Development Associated, Inc, and Power Reactor Development Co.

Duquesne Light Co's **Joseph P. McAteer** retires as assistant to the vice president of the sales division after 49 years with the company.

Tom Quast has been elected to succeed **Dean Barline** as chairman of the Puget Sound Utilities Council. Quast is a commissioner of the Snohomish County PUD, Barline represented Tacoma City Light.

Newly elected president of Pacific Coast Electrical Association is **George N. Hawley,** vice president of Southern California Edison Co.

Minnesota Mining & Manufacturing Co has elected **Robert H. Tucker** as secretary, **Irwin R. Hansen** as treasurer, **Kelvin T. Bacon** as assistant treasurer, and **Thomas J. Lyons** as assistant secretary.

Walter S. Herrstrom has been elected vice president in charge of manufacturing for Harvey Hubbell, Inc . . . Recently named director of new product development of Sylvania Electric Products, Inc, was **Clinton H. Harris.**

At General Electric Co, **Robert W. Miller** was named headquarters induction heating sales specialist, industrial heating department . . .Apparatus Sales Division has designated **John H. Reynolds** manager of foreign installations-turbines section of the installation and service engineering department.

Miles C. Kunz has been advanced to the position of chief engineer of Weston Electrical Instrument Corp's newly formed product engineering department.

Warren M. Trigg has become manager of Westinghouse Electric Corp's motor department. . . . Recently named manager of fluorescent lamp engineering was **George S. Evans. . . . W. M. McMunn** has been appointed manager of the Manufacturing and Repair Division's newly created manufacturing products department.

Harold S. McCullagh, former controller of Curtis Lighting, Inc, has been elected as treasurer to fill a post vacant for several years.

The heat transfer and water conditioning department of Allis-Chalmers Manufacturing Co has named **C. W. Bloedron** assistant manager, **S. M. Austin** sales manager of heat transfer products, and **T. J. Hodan** sales manager of water conditioning products.

C. & D. Batteries, Inc, has designated **Wallace M. Schleicher** as manager of motive power and railroad sales.

Federal Pacific Electric Co's Long Island City regional plant has as its new manager **Melvin B. Cole.**

Atomics International, a division of North American Aviation, Inc, has designated **Dr Henri Polak** European representative. He will represent the firm in its activities in the nuclear energy field in Europe.

Dr Morris Rubinoff has joined the government & Industrial Division of Philco Corp as manager of digital computer engineering.

OBITUARY

William Victor Drake, 60, retired vice president of West Penn Power Co, died in Pittsburgh, Pa., recently after an illness of several years.

Leon A. Doughty, 70, president and co-founder of C. & D. Batteries, Inc, died suddenly after suffering a heart attack at his Glenside, Pa., home.

Alfred F. Gardella, 71, former vice president of the Suburban Gas & Electric Co and associated with the New England Electric System for 50 years, died at Revere, Mass.

J. E. E. Royer, 72 former vice president of Washington Water Power Co, died recently after a lingering illness. He had retired as vice president last year after more than 48 years with the utility.

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SALES ASSIGNMENTS

COMPANY STAFFS

Anderson Electric Corp has designated Hubert James, Jr, as western regional sales manager with headquarters in the new regional sales office in San Francisco. He will cover the eleven Western states.

Bristol Co has named James W. Caswell as southeastern representative for the Socket Screw Division.

Brown Co has elevated Raymond E. LaPlante to assistant manager of West Coast sales for the company's complete line of pulp, paper, Nibroc towels, Bermico, Onco, and chemical products. His office will be in San Francisco. . . . John C. Moore is new salesman with the Bermico Division in the Southwest territory, with headquarters in Dallas, Tex.

General Electric Co's S. F. Long is new manager of the Chicago district sales office, Silicone Products Department.

Gould-National Batteries, Inc, has named Harold M. Cragg as the St. Paul district manager of the Industrial Division. He will supervise sales and service in Minnesota, Iowa, and South Dakota from the district office at St. Paul.

International Rectifier Corp has designated Henry Di Mond district manager of the new sales office at Cambridge, Mass., and has named John Vickery industrial sales manager at the firm's main office in El Segundo, Calif. Herman Bloom becomes distributor sales manager.

Okonite Co's new sales office in Wilkes-Barre has as its manager Trevor Aston. He will serve the anthracite region and northwestern Pennsylvania.

Philco Corp's Government & Industrial Division has appointed John Kinnally as manager of the Dayton, Ohio, office.

Joseph T. Ryerson & Son, Inc, recently named Clive C. Earle as sales manager for the Buffalo plant.

REPRESENTATIVES

Automatic Switch Co has designated Lakeland Engineering Equipment Co of Minneapolis, Minn., and Leinart Engineering Co of Knoxville, Tenn., as authorized stocking distributors of Asco solenoid valves.

Curtis Musgrove Co, upon closing the Waco, Tex., office, has transferred O. K. Anderson to Tulsa, where he will have charge of the Oklahoma territory. The company has also established a San Antonio office with R. D. Erb in charge.

Subox, Inc, has announced that Charles R. Bowser is now with John Hart & Sons in Chicago, the mid-west sales and service representative for Subox and Subalox products.

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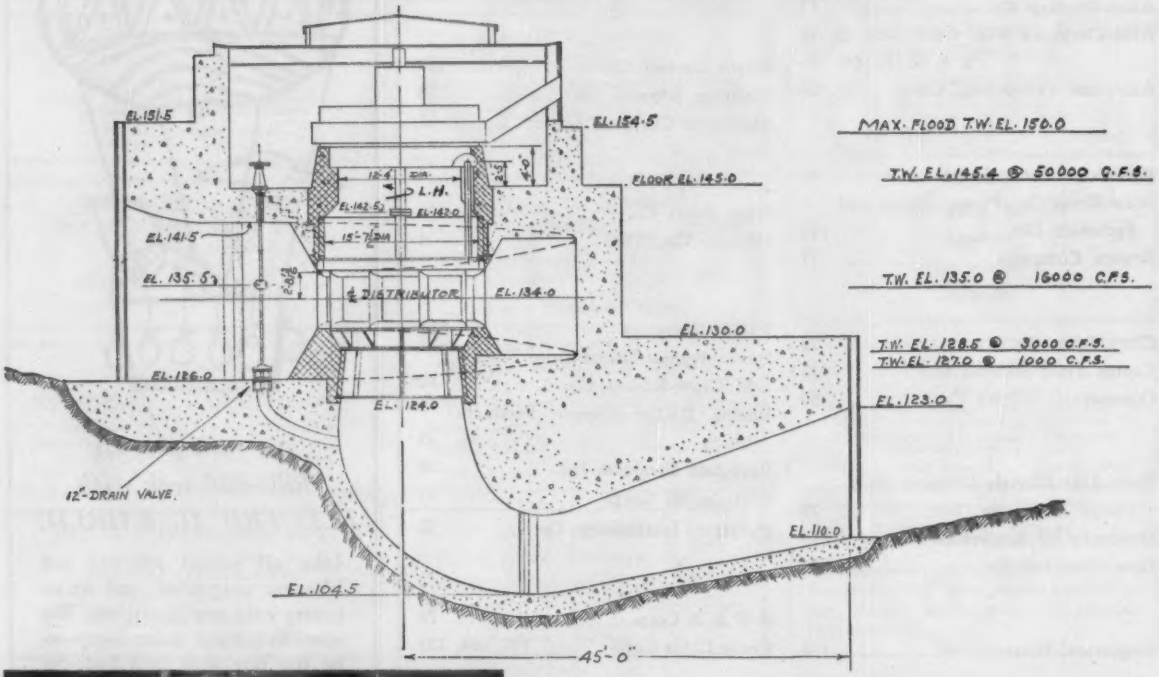
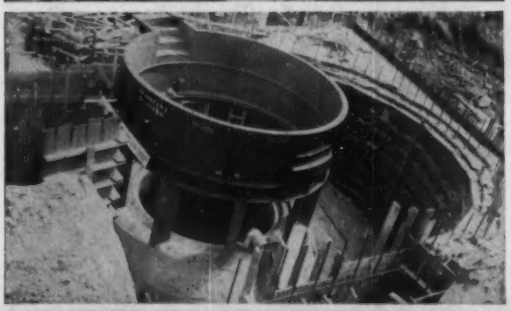
at the Central Maine Power Company's Bar Mills Station

Two Leffel Turbines Help Boost Power Output By 150%





An increase in annual output from 8,500,000 KW hours to 21,000,000 KW hours is expected by the Central Maine Power Company as a result of the recently completed rebuilding of their Bar Mills Hydroelectric Station. Two Leffel turbines—replacing four smaller turbines installed in 1919—play a major role in the Bar Mills redevelopment.

Each of the turbines is rated to develop 3,000 HP at 120 RPM under a twenty foot net effective head. The turbines, of the fixed-blade propeller type, are installed in concrete spiral casings and mounted on curved concrete elbow draft tubes.

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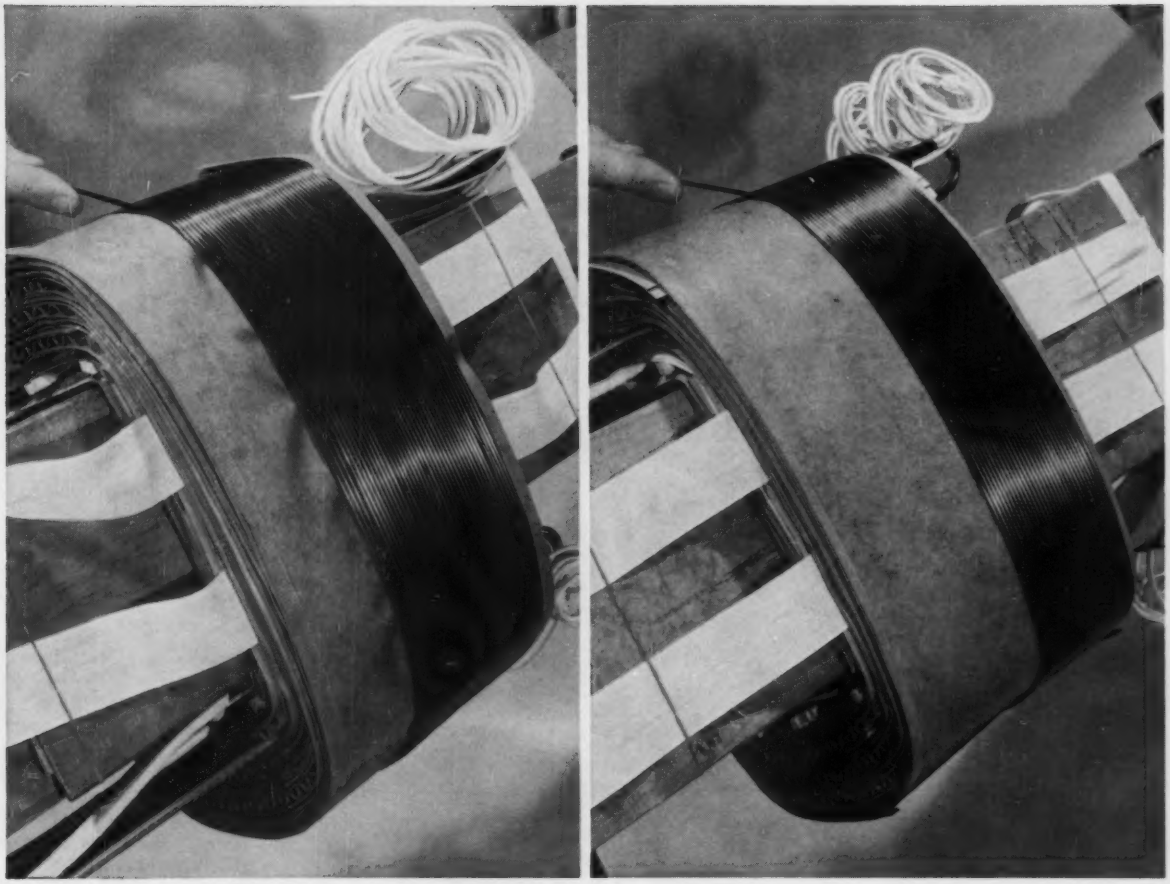

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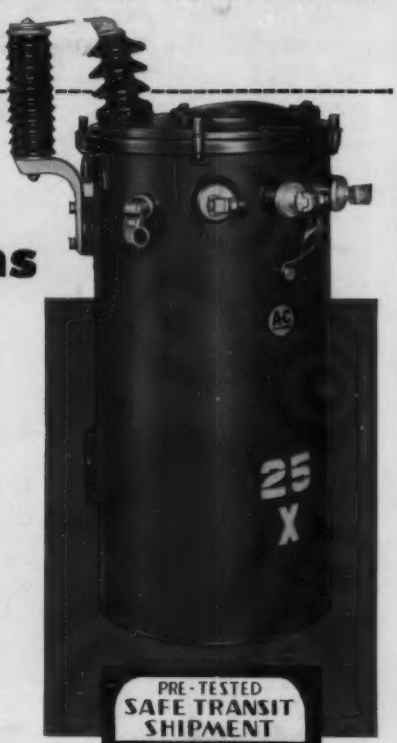

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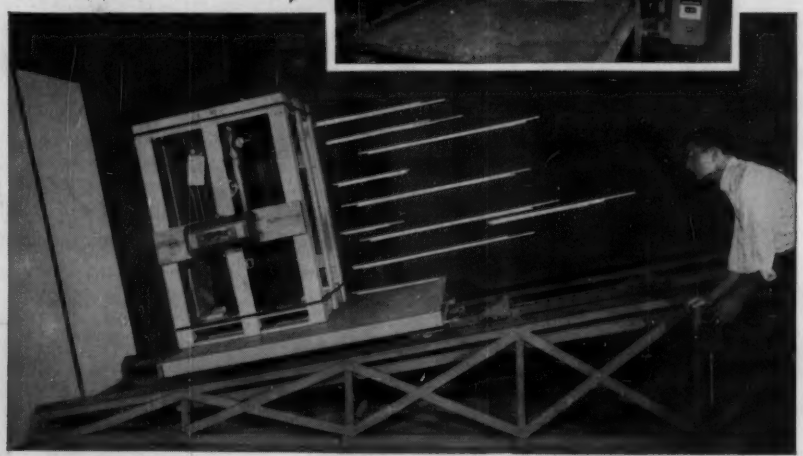

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